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A Study of Recreational Boating on Lake Austin, Texas

A Study of Recreational Boating on Lake Austin, Texas has been produced by the Lower Colorado River Authority in association with the City of Austin, TX and the Department of Recreation, Park and Tourism Sciences at Texas A&M University

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EXECUTIVE SUMMARY

Five objectives guided this investigation:

1. Determine the characteristics of boaters and their use patterns across Lake Austin;
2. Examine the perceived social, natural resource and management conditions among boaters;
3. Determine the nature and magnitude of conflicts between boaters and locate/illustrate where these conflicts occur;
4. Locate/illustrate and evaluate peak boating distribution densities; and
5. Determine a baseline for use in future comparisons across time on Lake Austin for: (a) peak use volumes and locations, (b) boater characteristics, and (c) attitudes toward lake conditions and management preferences.

This investigation introduced measures of boaters' experiences to provide insight on their perceptions related to boating experience and conditions encountered for the 2008 boating season. Data collection occurred between Memorial Day weekend and Labor Day weekend. Three hundred and ninety-nine (399) surveys were completed on-site. Forty-seven of these onsite respondents completed a follow-up mailback/online survey. We also obtained 407 completed mailback/online surveys from Lakeshore Property Owners and 121 completed surveys from Marina Slip Tenants. Boating density was objectively measured using aerial photography and vehicle/trailer parking lot counts. Following is an overview of the findings emerging from our analyses.

Boaters' Use History and Visit Characteristics

- The sample was comprised of boaters with long histories of boating; an average of 29 years boating in general and approximately 13 years since their first visit to Lake Austin.
- Most were day visitors (94.3%) who traveled from the surrounding communities with the average distance travelled being under 25 miles.

Boaters' Perceptions of Setting Density

- Lakeshore Property Owners were the most critical of encounters with other boaters on Lake Austin. They were more likely to indicate; a) preferring to have encountered fewer people, b) encountering more people than they expected, c) the encounters with other boaters detracted from their enjoyment.
- Overall, respondents' evaluation of the lake's setting density did not adversely impact their boating experience. However, a large percentage (69.5%) of Lakeshore Property Owners indicated that encounters negatively impacted their experience. In response to encountering, or the anticipation of, crowded conditions, boaters tended to employ several coping strategies: 1) changed the timing of their boating, 2) avoided certain locations on the lake, and c) were able to accommodate the conditions and maintain an enjoyable outing.

Areas of Lake Austin Most Used

- Boat count zones (service areas) 1 and 2, representing the upper 14 miles of the lake, were the most intensely used areas. These zones run from Mansfield Dam to the Ski Shores area. Boat counts across those two zones averaged approximately 80 watercraft (40 in each zone) over the four weekend flights.

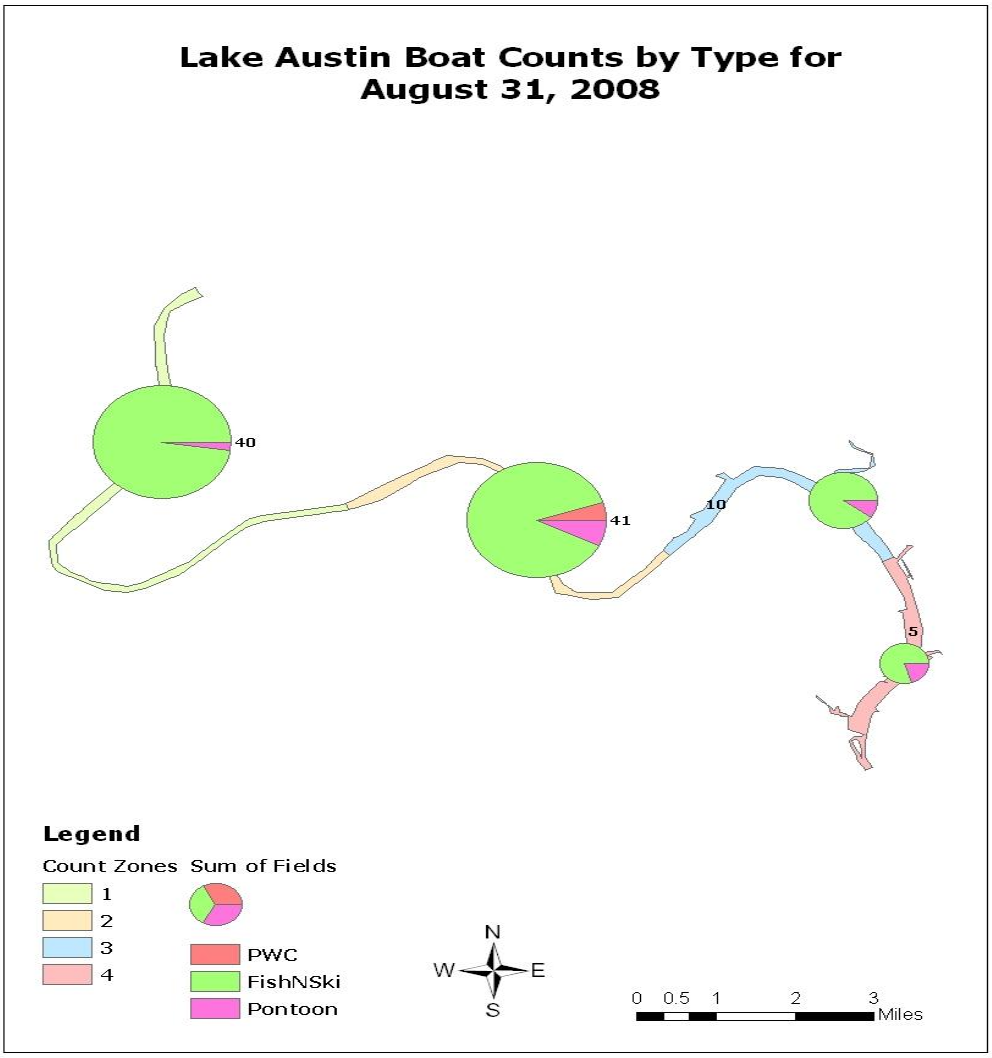

Figure 1. Lake Austin Labor Day Weekend Aerial Boat Count by Service Area

Boaters' Favored Locations

- The highest percentages of favorite locations were somewhat evenly distributed among zones 1, 3 and 4. Zone 1 includes approximately 9 miles from Mansfield Dam past Commons Ford Ranch Park. Zone 3 represents approximately 3.5 miles of the lake, including the "360 Bridge" and the Austin Country Club. Places within this zone were also most often listed as those which boaters avoided. Zone 4 covers about 3 miles of the lake from the mouth of Dry Creek to the Tom Miller Dam.
- Lakeshore Property Owners reported more favorite places than either Boat Ramp Users or Private Marina Slip Tenants in addition to expressing stronger attachment to the locations.

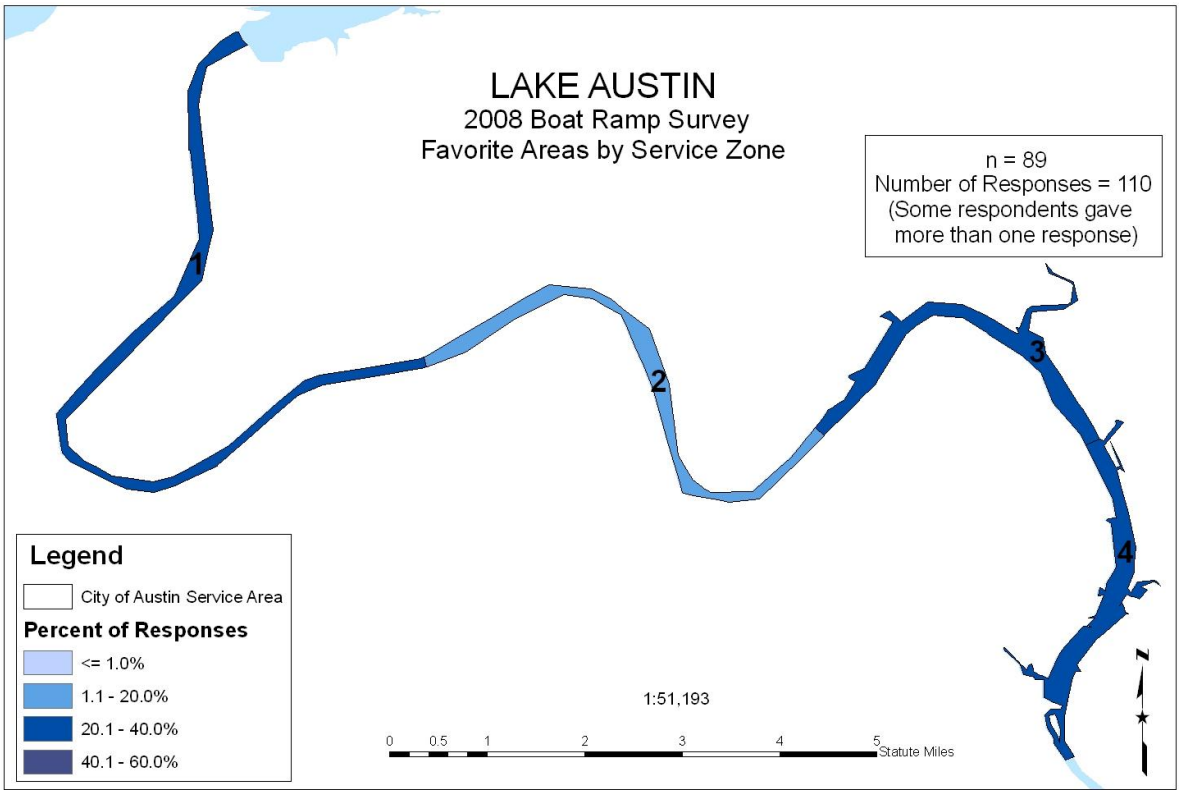

Figure 2. Lake Austin Boat Ramp Users Favorite Areas by Service Zone

Elements Boaters Liked Best/Least about their Visit on the Lake

- Respondents reported water conditions, scenery and time with family as features they liked best about their visit. Crowded conditions, loud music and large wakes were things they liked least.
- With regard to lake conditions, while Lakeshore Property Owners were most critical, physical elements (e.g., water quality, shoreline erosion) were not perceived as a serious problem. The social condition of the lake (e.g., unsafe operation of boats, noise, inconsiderate boaters), was evaluated as having a negative influence by all three boater groups.

Boaters' Perceptions of Change over the Past Five Years

- Among all boaters, the most frequently cited positive change that occurred on Lake Austin over the previous five years was, overwhelmingly, the carp/hydrilla control program. The increased presence or better demeanor of law enforcement was also mentioned by all three boater groups.
- Negative changes noted by respondents referred to crowded conditions on the lake including behaviors of other boaters related to noise (e.g., volume of music) and creation of wakes.

Areas Avoided and Areas Considered Unsafe

- The 360 Bridge was the most frequently cited place to avoid by all three boater groups. Places where people gather, like parks and restaurants (e.g., Hula Hut), were also mentioned as places they avoided. These were also the areas that boaters felt most unsafe.

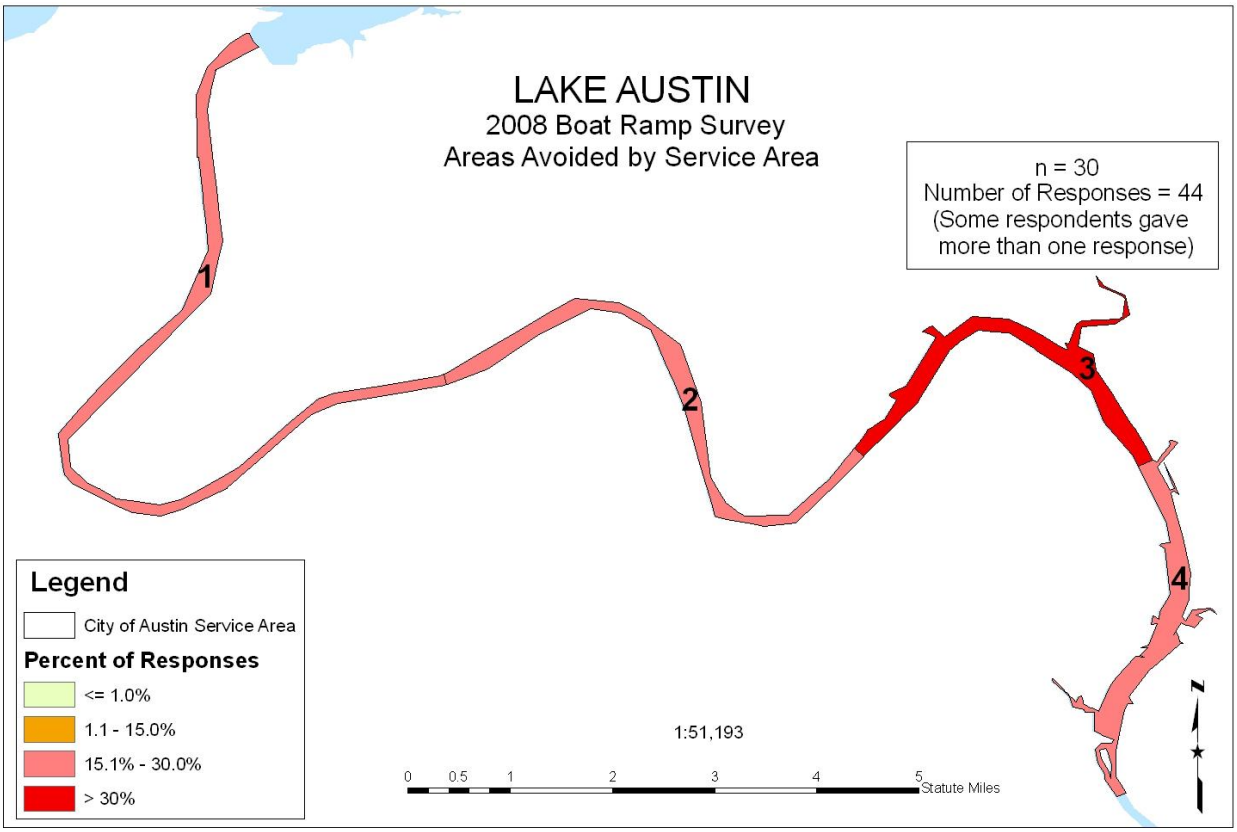

Figure 3. Places Lake Austin Boat Ramp Users Most Often Avoided by Service Area/Zone

Boaters' Perceptions of Regulations

- Support for introducing new boating regulations that reduce noise and wakes drew at least moderate support across the three boating groups. Lakeshore Property Owners were most supportive of introducing more stringent regulations but Marina and Boat Ramp Users were also somewhat supportive. Between 60% and 70% of Lakeshore Property Owners support regulation of motor noise, music volumes and wakes. Between 40% and 50% of Marina and Boat Ramp Users also support noise and music regulations.

Introduction

The population of the Austin – Round Rock Metropolitan Statistical Area (MSA) was over 1.45 million people in 2006 having grown almost 16% from 1.25 million in 2000. Much of the development associated with that population growth continues to pressure Lake Austin and the western portion of the MSA in general (City of Austin, 2007). As the population of the area continues to grow the pressures on Lake Austin and many other recreational resources in the region continue to mount. Increased demand stresses physical resources and can lead to social conflicts between user groups. Levels of safety, boater behaviors, water conditions and amounts of development can change and create points of contention among user groups and they can change the quality of the physical resource.

Recreational Capacity

For over forty years, research has examined the relationships between the amount of recreational use in a place and its influence on enjoyment. Early on, the basic hypothesis was that as use and density went up recreational satisfaction or enjoyment would decline. However, contemporary knowledge indicates the relationship is not that simple, rather that it depends on both the resource (e.g., urban lake to wilderness trail) and on the perceptions of people who use the resource (e.g., kayakers, motor boaters, hikers or horseback riders). It is important to understand user perceptions in the local context and, if possible, if and how those perceptions change over time (e.g., across a season, across several years). It is important to understand what goals users have for an activity and the preferences they have for the setting. Because recreationists interfere with each other's goals, the concept of crowding is often employed to examine recreational enjoyment.

Crowding

Crowding is what occurs when the density of use and related behavior begin to negatively influence an experience. Perceptions of crowding vary considerably across all types of settings. People in a bar, attending a carnival, picnicking in a neighborhood park and floating on a wilderness river would all have somewhat different perceptions of crowding based on both the density of people in the place and what they were doing. Even within the same setting, for example the wilderness river, people's perceptions about the relationship between numbers of people and crowding can differ considerably. Some people come to a place hoping to see very few other people and to experience quiet, calm surroundings while others may see the same setting as a place to socialize in large groups, putting less of a premium on quiet and calm. The types of recreation people pursue can also influence this relationship. Differences have often manifested themselves between people who use motorized equipment and those who do not. Recreationists paddling canoes, for example, have a lower tolerance for motor boaters than motor boaters do for canoes.

Safety

While perceptions of user density (e.g., number of boats in a cove) may create feelings of crowdedness and interfere with goals related to a quiet, calm experience, high density can also influence safety. The carrying capacity of recreational resources like lakes can be thought of as having a social dimension (e.g., feeling crowded) an ecological dimension (e.g., water quality) a facility dimension (e.g, number of parking spaces at a boat ramp) and a physical capacity (i.e., the amount of space physically available for an activity). Given the ways people engage in many different on-water activities managers have to be

concerned with how density relates to the physical capacity afforded by the surface area of a given lake. As physical capacity is approached and/or eclipsed, accidents reach unacceptable levels. Providing for the reasonable use of Lake Austin while also protecting the resource is a difficult task for managers. Input from recreational visitors and residents is useful in making decisions that can best support a balance between use and protection.

This study was designed to gather input from many types of lake users in order to better understand perceptions and behaviors related to Lake Austin. There were also physical counts made on the lake and in surrounding facilities so that relationships between actual numbers, perceived enjoyment and safety could be understood. This type of information can be used to better manage Lake Austin as demand for residential and recreational access continues to increase. The following section on methods lays out how we obtained data that were useful in examining these, and other, concerns.

Methods

Onsite Interviews with Public Boat Ramp Users with Mail Follow-up

Onsite exit interviews were conducted at public boat ramps over the summer of 2008 from 5/25/2008 (Memorial Day weekend) through 9/1/2008 (Labor Day weekend). Four boat ramps across Lake Austin were selected (see Table 1 below). Only one interviewer was situated at each ramp during the sampling period. Surveying occurred between 8:00am and 8:00pm over 28 sampling days. These sampling days consisted of 17 weekend days, 8 weekdays and 3 public holidays.

Table 1. Sample Distribution on Lake Austin

Site	***Sampling Days***
Walsh Boat Landing	21
Plaza on the Lake (Loop 360)	22
Emma Long Park	7
Mary Quinlan Park	6

Boaters exiting the lake were approached by trained Texas A&M interviewers at the selected boat ramps. After a short introduction to the study, boaters were then requested to participate in a short interview lasting approximately five minutes. See Appendix 3 for an example of the onsite survey. Three hundred and ninety-nine surveys were completed with 229 refusals (63.5% response rate, see Appendix 2 for more on sampling by location and responses).

At the conclusion of the survey the boater was requested to participate in a more extensive survey examining recreational boating on Lake Austin. One hundred twenty-three subjects agreed to supply us valid email and/or postal addresses.

The protocols we adopted for the distribution of the mail surveys were adapted from Dillman's (2002) total design method. First, in October, boaters who supplied email addresses, alone, were sent a weblink directing them to a website to complete the questionnaire. Over the following month, five reminder emails were sent to non-respondents. For boaters supplying postal addresses alone, we sent a survey packet including a cover letter describing the study, a survey instrument, and postage paid reply envelope. Two weeks following the initial mailing, a reminder/thank you postcard was sent. A final survey packet was sent to non-respondents early January 2009. These procedures yielded 47 completed surveys and 57 non-deliverables, resulting in a 36.6 % effective response rate.

Sampling of Lakeshore Property Owners

Postal addresses of residents residing around Lake Austin were extracted from the 2007 Real Estate Property data (Travis County). Arc/Info Geographic Information Systems (GIS) software was used to identify tax assessors' property parcels that were lots containing single/multiple family dwellings adjacent to the lake. GIS shape files with attribute tables including property ID, owner names, addresses, city, state, zip and state property tax board code were derived from the Central Appraisal District. To ensure that we identified property owners with lake frontage, we first used a 500' radius of the water

boundary to select lake front property parcels. Parcel IDs with zero value (public lands, streets, etc) were eliminated from selection. Parcels without property owners' names and addresses were also removed. Finally, non-single/multiple family dwellings (e.g., vacant lots, commercial, agricultural, etc.) were screened out. A total of 978 single/multiple family dwellings were selected in our sampling plan from Travis County on Lake Austin.

The protocols we adopted for the distribution of the mail surveys were, again, adapted from Dillman's (2002) mixed mode survey (mail and internet) method. On October 17, 2008, the identified residents were sent an initial letter informing them of the study and the opportunity to complete the survey online or to have a hard copy sent to them. We indicated in the letter that if they had not completed the survey online within a week of receiving this letter, we would be sending them a hardcopy to be completed and returned in a postage-paid envelope. This initial screening letter also helped identify "bad addresses" (*n*=43). Two weeks following the mailing of the initial contact letter, a survey packet including another cover letter, survey instrument, and postage-paid reply envelope were sent to residents who had not completed the questionnaire online. A month following the initial mailing, a reminder/thank you postcard was sent to all 918 (60 non-deliverables) residents. A final survey pack was sent to non-respondents early January 2009. The procedures yielded 407 completed surveys (44.3% response rate).

Sampling of Private Marina Tenants

A total of four marinas were contacted to participate in the survey. Owing to concerns expressed by some marina managers relating to the privacy of their tenants, several methods were employed to distribute the surveys:

1. A weblink to the survey was sent to the marina manager who then forwarded this link to his/her tenants;
2. Hard copies of the survey, cover letter and postage paid return envelopes were sent to the marina manager for he/she to distribute among their tenants; and
3. Two marina managers passed along the tenant mailing list allowing us to distribute the survey using the Dillman (2002) protocols. In this instance, the tenants were sent an initial letter informing them of the study and the opportunity to complete the survey online or to have a hard copy sent to them. We indicated in the letter that if they had not completed the survey online within a week of receiving this letter, we would be sending them a hardcopy to be completed and returned in a postage-paid envelope. Two weeks following the mailing of the initial contact letter, a survey packet including another cover letter, survey instrument, and postage paid reply envelope were sent to residents who had not completed the questionnaire online. A month following the initial mailing, a reminder/thank you postcard was sent. A final survey pack was sent to non-respondents early January 2009. The procedures yielded 121 completed surveys.

Overall, this approach does not allow us to estimate response rates given that we do not know to whom marina managers distributed the survey.

Onsite Parking Lot Counts

Onsite interviewers conducted parking lot counts at four public boat ramps every two hours, beginning upon their arrival. The counts coincided with the onsite interviews of public boat ramp users. Interview

periods were eight hours. Counts focused on the number of; (a) cars with boat trailers, (b) cars alone, and (c) trailers alone.

Aerial Flights

Four areal flights were conducted throughout the summer of 2008; 7/12, 7/20, 8/3, and 8/31. These flights coincided with the interview periods conducted at public boat ramps. A digital camera was mounted on aircraft supplied by Texas A&M's Flight Research Laboratory. Images of the lake were taken between 11.30am and 3:00pm. Flying between four and five thousand feet, the camera was programmed to take images of the lake every 5 seconds. These images were later "stitched" together to create a single contiguous image of the lake. The images were used to document the number, type, and location of vessels on the lake.

FINDINGS

The findings we report below are broken in eight sections:

1. **Section 1: Summary of Key Findings –** Discusses key findings emerging from the data.
2. **Section 2: Respondents' Household Information –** Displays data profiling respondents' household characteristics including their: (a) education; (b) employment status; (c) race; (d) income; and (e) economic status and its impact on boating use.
3. **Section 3: Boater Profile** – Displays data related to: (a) respondents' history of use on Lake Austin and boating in general; (b) the characteristics of respondents' visit (i.e., activities, time, group composition, and distance traveled); and (c) the watercraft they use on Lake Austin.
4. **Section 4: Boaters' Experiences** – Displays data concerning: (a) respondents' favorite locations and the attributes of these settings; (b) the intensity of respondents' attachment to their favorite settings; (c) the locations where respondents spent most of their time; (d) the locations that respondents avoided; (e) the locations where respondents felt unsafe, (f) reported elements that respondents like most/least about their visit; (g) perceptions of setting density; (h) perceptions of lake conditions; (i) motives for boating; (j) respondents' evaluations of their boating experiences for the 2008 season; (k) commitment to boating; (l) coping responses to adverse elements; and (m) perceptions of change on Lake Austin that have occurred over the previous five years.
5. **Section 5: Boaters' Management Preferences –** Displays data on respondents' perceptions of current and potential management actions for Lake Austin. These data include summaries of respondents': (a) perceptions of regulations (current and potential); and (b) knowledge of boating safety.
6. **Section 5: Boat Counts – Boat Ramp and Aerial –** Displays data derived from boat counts at parking lot counts at the public boat ramps and aerial flights.
7. **Section 7: Comparisons Across Lakes Travis, Lyndon B. Johnson and Austin –** Displays comparisons on key variables across each of the lakes. These variables included**:** a) the characteristics of other boaters, the activities they participated in, along with their vessel types; b) boaters' perceptions of setting density, crowding and unsafe conditions, c) boaters' experience and use history, and d) the distance they travelled to the lakes.
8. **Section 8: Conclusions –** Includes; (a) summary of key findings, (b) implications for the management of recreational boating on Lake Austin, and (c) suggestions for future research.

Our reporting of quantitative data focuses primarily on means (*M*) for ordinally scaled measures and frequencies (*n* and %) for the categorical measures. In some instances, reported percentages may total above or below 100 percent owing to rounding. For open-ended items, summaries of the main themes are reported or frequencies of repeated themes. Last, we used GIS analyses to develop a series of maps that visually represent much of the quantitative data (e.g., areas avoided, most frequented, etc.).

Service Areas and Management Compartments

We established four service areas along the lake. These service areas were portioned around each of the public access points to the lake and are approximately equal to one another with regard to their surface area. The establishment of the initial service areas was undertaken to move beyond lake-wide goals, toward goals for specific areas of the lake. The designation of the service areas acknowledges differences in conditions on the lake and in the recreation opportunities offered from one end of the lake to the other.

The designation of the service areas was based on our; (a) knowledge gained through the conduct of our pilot study in 2007 concerning boat access points and boat traffic patterns, (b) existing knowledge about shoreline development and the location of major communities adjacent to the lake, and (c) consultation with City of Austin staff. Throughout the report, we report data on key variables by these service areas and management compartments.

SECTION 1: Respondents' Household Information

A. Education

Respondents associated with Lake Austin were relatively well educated with 45% holding a graduate or professional degree of some type. Almost 90% were college graduates. The relatively high level of education was reflected in the fact that over 80% of respondents had an annual income of over $100,000. Over 36% had an annual income in excess of $300,000. The majority of Lake Austin users indicated that they are in about the same economic situation they were in last year but a majority (54.6%) also felt they boated a little less in 2008 due to a worsening economic situation. There were differences among the three groups we used to describe lake users. Lakeshore Property Owners and Marina Slip Tenants were both the best educated and had higher income levels than Boat Ramp Users. There were also differences in employment status with over 30% of Lakeshore Property Owners indicating a retired status. The sample was almost 95% Caucasian. Tables 2 – 5 contain additional detail on these demographic characteristics.

Table 2. Educational Characteristics of Lake Austin Boaters in 2008

(%)	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
8 grade or less	0	0	0	0
9th to 11th grade	0	0.3	1.1	0.4
12th grade (high school graduate)	2.6	2.0	1.1	1.9
13-15 years (some college)	30.8	10.4	6.3	11.2
16 years (college graduate)	33.3	26.3	32.6	28.1
17+ years (some graduate school)	10.3	14.5	10.5	13.3
Masters, Doctoral, or Professional Degree	23.1	46.5	48.4	45.0

B. Employment Status

While most respondents (61%) were not retired and employed full time, over 16% were retired and not working. The highest percentages of retirees were among the Lakeshore Property Owners, where over 30% were retired and over 20% were not working.

Table 3. Employment Characteristics of Lake Austin Boaters in 2008

(%)	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Employed, full time	84.6	54.4	76.6	61.2
Employed, part time	2.6	4.6	4.3	4.3
Retired, but working full time	0	4.3	2.1	3.5
Retired, working part time	2.6	10.0	6.4	8.7
Retired, not working	2.6	21.1	5.3	16.5
Homemaker	0	3.4	2.1	2.9
Unemployed	0	0.3	1.1	0.4
Student	2.6	0.3	0	0.4
Other	5.1	1.7	2.1	2.1

C. Race/Ethnicity

There was little variation in race and ethnicity among boaters on Lake Austin in 2008. Almost 95% of the sample was White, of non-Hispanic origin.

Table 4. Race/Ethnicity Characteristics of Lake Austin Boaters in 2008

(%)	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Native American or Alaskan Native	8.9	0.5	2.0	1.1
Asian or Pacific Islander	0	0.3	0.3	0.2
African American	0	0	0.3	0.2
Hispanic	2.2	1.5	4.9	1.6
White, not Hispanic	84.5	95.0	90.8	94.7
Other	4.4	2.7	1.7	2.2

D. Household Income

Income varied considerably among the three boater groups. Lakeshore Property Owners and Marina Tenants were much more likely to be affluent with between 35 and 50% having incomes of over $300,000 per year. Only 5% of Boat Ramp Users, on the other hand, were above the $300,000 level.

Table 5. Annual Household Income of Lake Austin Boaters in 2008

(%)	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Less than $25,000	0	0.3	0	0.2
$25,000 - $49,999	5.6	2.3	0	2.1
$50,000-$74,999	5.6	5.9	1.1	4.9
$75,000-$99,999	19.4	8.2	5.7	8.6
$100,000-$149,999	36.1	16.1	10.2	16.6
$150,000-$199,999	19.4	11.8	15.9	13.3
$200,000-$249,999	5.6	10.8	9.1	10.0
$250,000-$299,999	2.8	8.5	8.0	7.9
$300,000 or more	5.6	36.1	50.0	36.4

E. Economy and Boating Behavior

Many (40%) Lake Austin boaters indicated that they were worse off economically than last year. Among those who said that the economic situation influenced their boating, 74% indicated that in 2008 they boated a little or even a lot less than they had in the past. Among the three groups, Lakeshore Property Owners and Marina Slip Tenants were more likely to have been affected and to have boated less in 2008. On the other hand, over 50% of boat ramp users felt that their economic circumstances had them boating more often.

Table 6. Economic Status Related to Behavior of Lake Austin Boaters in 2008

(%)	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
How has your economic status changed in the past year?				
Better than last year	23.1	10.2	24.5	14.1
Did not change	48.7	49.1	35.1	46.3
Worse than last year	28.2	40.6	40.4	39.6
Did the change in your economic circumstance impact the frequency of your boating? (yes)	34.2	12.7	8.6	13.6
If “yes,” how				
Boated a lot more	15.8	2.8	5.6	5.6
Boated a little more	36.8	12.7	16.7	17.6
Boated a little less	47.4	54.9	61.1	54.6
Boated a lot less	0	25.4	16.7	19.4
Stopped boating	0	4.2	0	2.8

SECTION 2: Boater Profile

In this section of the report, we describe the characteristics of our sample's use of Lake Austin. For the Public Boat Ramp use group, we had trained researchers interview boaters as they exited the lake. These boaters were asked about their experiences on the lake on the day they were interviewed. Consequently, some questions were not relevant for Lakeshore Property Owners or Private Marina Slip Tenants. In these instances, cells marked "n/a" indicate that the group were not presented with the question.

A. Use History

While the different boating groups varied tremendously with regard to the extent and mode of their use of Lake Austin and other lakes, all could be considered very experienced users of the lake (see Table 7 below). For Boat Ramp Users, most indicated that that they had previously visited Lake Austin (92.9%) and reported, on average, 1995 as the year of their first visit. We observed that they were loyal in their use of Lake Austin, reporting over 19 visits (*M*=19.4) over a typical year and 98 percent (97.8%) indicating that the lake was their most often-used lake. Lake Austin Boat Ramp Users, however, were also significantly[12] more likely to report using Lake Travis compared to Lakeshore Property Owners and Private Marina Slip Tenants. Boat Ramp Users were almost exclusively day users (94.3%). Of those who indicated staying overnight, visits averaged a little over three days (*M*=3.2).

In terms of respondents' boating experience, we found that Lakeshore Property Owners had significantly more experience boating than the other two groups[3] (*M*=32 years). Over the past 12 months, however, they reported not boating as frequently as Boat Ramp Users who boated an average of 42 times. Finally, on average, Lakeshore Property Owners had lived on Lake Austin for 16 years (*M*=15.6 years) and 86 percent indicated owning a private dock.

[1] χ^2= 16.6, df= 4, *p*= 002

[2] We use "significant" throughout this report to indicate differences or relationships that are not random occurrences (95% confidence). See Appendix X for definitions of statistical terms used throughout the report. Analyses were conducted with the *Statistical Package for the Social Sciences (SPSS* version 16.0).

[3] F=33.89, df= 2, 514 *p*=0.000

Table 7. Boaters' Use History of Lake Austin

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
First Visit (% yes)[1]	7.1	n/a	n/a	7.1
Year of first visit (M)	1995	n/a	n/a	1995
Before 1980 (%)	13.5	n/a	n/a	n/a
Between 1980 and 1990	14.7	n/a	n/a	n/a
Between 1991 and 2000	29.3	n/a	n/a	n/a
Between 2001 and 2005	27.0	n/a	n/a	n/a
Since 2006	15.5	n/a	n/a	n/a
Frequency of visit (Times)[1]	19.4	n/a	n/a	19.4
Less than 5 (%)	41.3	n/a	n/a	n/a
Between 6 and 10 (%)	19.4	n/a	n/a	n/a
More than 10 (%)	39.3	n/a	n/a	n/a
Day Users (% YES)[1]	94.3	n/a	n/a	94.3
Overnight Users (% YES)[1]	5.7	n/a	n/a	5.7
Length of visit for overnight users (Days)[1]	3.2	n/a	n/a	3.2
Length of residence on lake (years)	n/a	15.6	n/a	15.6
Years boating	21	32	19	29
Days boating previous 12 months	42	33	23	31
Lake most often used (% yes)				
i. LBJ	29.4	18.0	20.7	7.4
ii. Lake Travis	79.5	52.5	42.6	54.7
iii. Lake Austin	97.8	94.8	100.0	96.2
iv. Others	44.4	13.4	6.8	14.5
Dock ownership (% yes)	n/a	85.6	n/a	85.6

[1]Question presented to boaters onsite at public boat ramps only

B. Visit Characteristics

We present in Table 8 data on the characteristics of respondents' visit to Lake Austin; i.e., time of day they started, activities, group, and boat usage. We observed that for Boat Ramp Users, the average time of departure was 10:23AM and that the departure times varied by "boating type," which is somewhat linked to activity type. Runabout/speed boat users typically started boating a little earlier (*M*=10:18am), followed by the fishing/Bass boat users (M=10:24 am), and the PWC users (M=11:25am).

As displayed in Table 8, the three most popular activities in which Boat Ramp Users engaged were fishing (81.8%), the use of personal watercraft (75.8%), and waterskiing/wakeboarding/tubing/water sports (52.2%).

We observed that the group composition of the three use groups was quite distinct. Private Marina Slip Tenants typically boated in the largest of groups (*M*=4.6). These groups were primarily comprised of family and friends (52.0%) or family alone (26.5%). Lakeshore Property Owners' group composition was similar to Marina Slip Tenants with groups being comprised mostly of family/friends combination (55.6%) or family alone (28.9%). The group composition for Boat Ramp Users was somewhat different from Private Marina Slip Tenants and Lakeshore Property Owners with groups comprised of friends only being higher (28.6%) than the other two groups[4]. Last, we observed that most boaters (98.8%) using

[4] χ^2= 24.06, df= 12, *p*=0.02

Lake Austin travel from within the state to access the lake. As determined by our sampling design, Lakeshore Property Owners reside closest to the lake. Predictably, most of the Lakeshore Property owners resided within Texas, as 83.2% indicated their home on Lake Austin was their primary residence.

Table 8. Characteristics of Boaters Who Use Lake Austin

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Time began boating[1]	10:23	n/a	n/a	10:23
Runabout /speed boat	10:18			
Fishing/bass boat	10:24			
Personal watercraft (PWC)	11:25			
Activities engaged (*M* % time)[1]				
i. Swimming (from boat)	26.7	n/a	n/a	26.7
ii. Cruising	48.6	n/a	n/a	48.6
iii. Fishing (from boat)	81.8	n/a	n/a	81.8
iv. Relaxing/sunning (boat stationary)	26.6	n/a	n/a	26.6
v. Lakeshore use	19.6	n/a	n/a	19.6
vi. Water skiing/wake boarding/tubing/water sports	52.2	n/a	n/a	52.2
vii. Personal watercraft use (jetskiing)	75.8	n/a	n/a	75.8
viii. Other	46.0	n/a	n/a	46.0
Group size (*M* # of people)	4.6	4.5	4.0	4.5
Group composition (%)				
i. By yourself	2.4	2.4	2.0	2.3
ii. Family	28.6	28.9	26.5	28.4
iii. Multiple families	2.4	2.7	1.0	2.3
iv. Family and friends	35.7	55.6	52.0	53.1
v. Friends	28.6	8.5	17.3	12.2
vi. Organized outing group	2.4	0.3	0	0.4
vii. Other	0	1.5	1.0	1.3
State of Primary Residence (% YES)	n/a	83.2	n/a	83.2
i. Texas (%)	98.8			
ii. Florida	0.6			
iii. Louisiana	0.3			
iv. Colorado	0.3			
Distance travelled (*M* miles)	55.0	1.2[2]	4.5	10.3
10 miles or less (%)	53.7	n/a	95.5	n/a
11 - 25 Miles	29.3	n/a	1.8	n/a
26 – 50 miles	9.8	n/a	1.8	n/a
51 – 75 miles	2.4	n/a	0.9	n/a
76 – 100 miles	0	n/a	0	n/a
More than 100 miles	4.9	n/a	0	n/a

[1]Question presented to boaters onsite at public boat ramps only

[2] Some Lakeshore Owners don't have immediate access to the lake

C. Watercraft Ownership

As displayed in Table 9 below, we illustrate that the most popular vessels used by all boaters on Lake Austin were runabouts/speedboats (65.4%). With regard to other vessels used by boaters on the lake, we observed some variation. For Boat Ramp Users, the next most popular vessel was fishing/bass boats

(22.0%) followed by PWCs (7.8%). Alternately, for Lakeshore Property Owners, the next most popular vessel was canoes or kayaks (33.9%) and then PWCs (31.4%). Among Marina Slip Tenants, high performance boats were the second most popular vessel (17.9%).

With regard to the size of Boat Ramp Users' primary vessel (question presented to Boat ramp Users only), the average size was 20 feet (*M*=19.9') and average horsepower was 161.

Table 9. Characteristics of Boaters' Vessels

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Boat ownership (% yes)[1]	100	82.8	100	87.3
i. Runabout /speed boat	47.8	66.3	87.2	65.4
ii. Fishing/bass boat	22.0	17.7	10.3	14.7
iii. Pontoon boat	5.9	17.2	12.8	14.9
iv. House boat	0.3	10.3	10.3	9.4
v. Cabin cruiser	1.1	10.8	12.0	10.2
vi. High performance boat	1.6	16.5	17.9	15.5
vii. PWC (Waverunner/jetski)	7.8	31.4	12.0	24.7
viii. Sailboard	0.3	9.8	11.1	9.3
ix. Canoe or kayak	4.9	33.9	11.9	26.5
x. Sailboat	0	11.3	11.1	10.4
xi. Other	8.3	13.4	12.8	12.2
Boat size (feet)[2]	19.9	n/a	n/a	19.9
Boat horsepower[2]	161.1	n/a	n/a	161.1

[1] Question presented to Lakeshore Property Owners. Ownership was given for the other two groups.

[2] Question was presented to respondents at public boat ramps only and referenced the vessel they were exiting with at the time the survey was conducted.

SECTION 3: Boaters' Experiences

In this section, we focus on elements associated with boaters' experiences on Lake Austin. We cover a broad range of issues that provide insight on boaters' thoughts and feelings about Lake Austin, in addition to boating in general.

A. Boaters' Favorite Locations

While most boaters reported a favorite location (see Table 10 below), Lakeshore Property Owners appear to be the most attached to the lake and their favored sites on the lake (71.1% reporting a favorite location). Alternately, Boat Ramp Users, while relatively attached, were least likely to report a favorite location and were more likely to indicate that they used other lakes (Table 7 above), which suggests some willingness to substitute an experience on another lake for one on Lake Austin.

Table 10. Boaters' Favorite Locations on Lake Austin

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Have favorite location? (%)	45.2	71.1	54.4	65.2

During their exit interviews, we asked Boat Ramp Users to identify on a map of Lake Austin their favorite location. In Figure 4, we present a map of service zones illustrating locations on the lake that respondents most frequently identified as their favored location. Service zone 1 extends approximately 9 miles from the Mansfield Dam just beyond Commons Ford Ranch Park; zone 2 extends from there approximately 6 miles to Ski Shores; zone three is the next 3 miles east and includes the Highway 360 Bridge and the Austin Country Club and; zone 4 extends 3 miles from Dry Creek to the Tom Miller Dam. As displayed in Figures 4, boaters' favorite places are found at both the eastern and western ends of Lake Austin in service zones 1, 3 and 4.

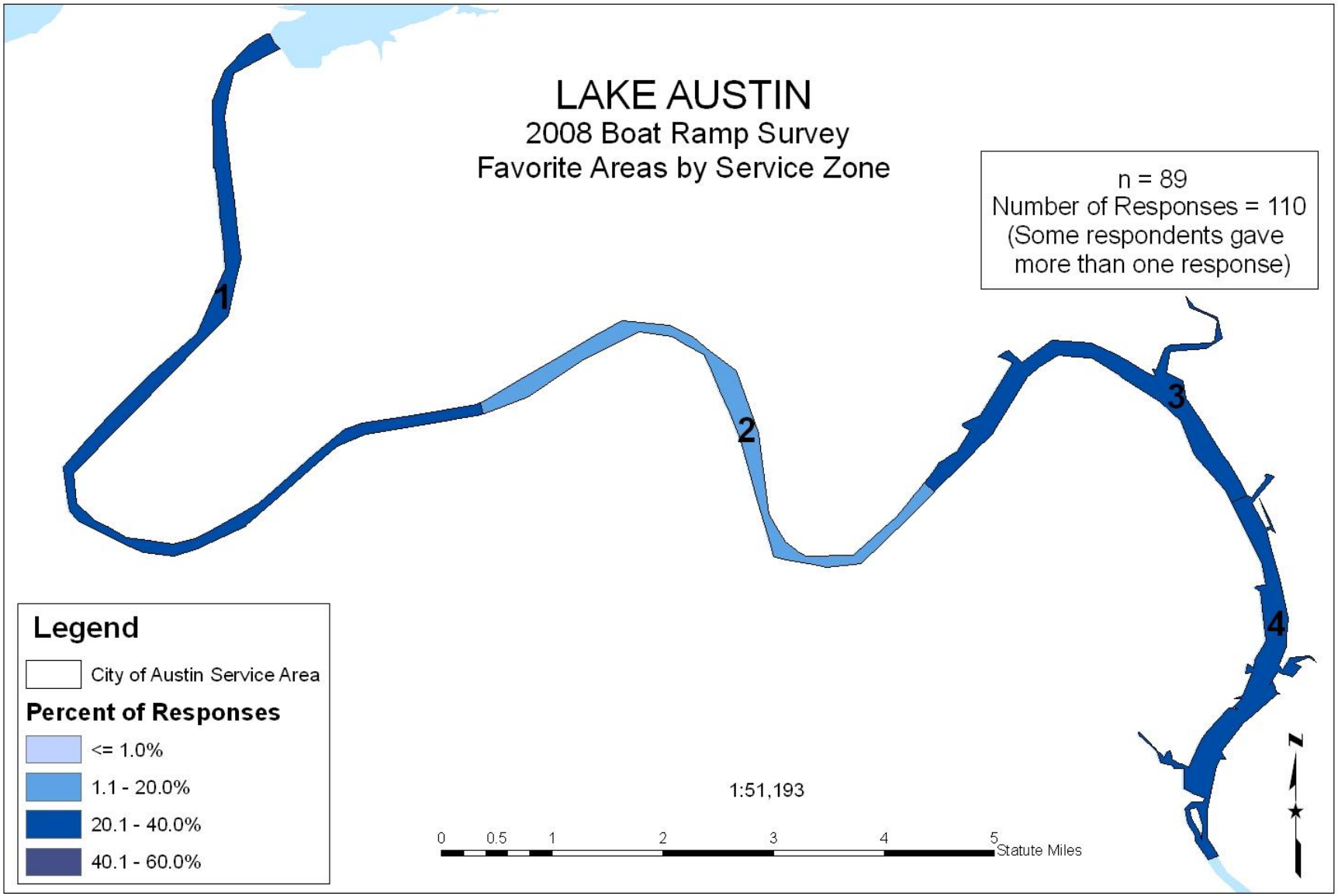

Figure 4. Boat Ramp Users Favorite Areas by Service Zone

All respondents were also asked to provide names of their favorite locations in the follow-up/mailback surveys. Table 11 below provides a summary of the most frequently reported sites that respondents identified for each of the boating groups. City Park (Emma Long Metro Park), the 360 Bridge and Mansfield Dam were among the most often cited favorite places on the lake. Among Lakeshore Property Owners, their place or their property was easily the most often mentioned favorite place.

Table 11. Names of Boaters' Favorite Locations on Lake Austin. (x) = number of mentions

Favorite Sites	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	Emma Long/City Park (6)	Their property (43)	Coves (12)
2.	360 Bridge (5)	Emma Long/City Park (27)	360 Bridge (9)
3.	It's a secret (3)	Mansfield Dam (19)	North End (7)
4.	Bull Creek (2)	North End (18)	Hula Hut (5)
5.	Coves (2)	360 Bridge (15)	Dam (4)
6.	Mansfield Dam (2)	Coves (14)	City Park (3)
7.		Ski Shores (13)	Ski Shores (3)
8.		Certain mile marker (12)	Tom Miller Dam (3)
9.		Bull Creek (8)	

If respondents indicated that they did have a favorite location on Lake Austin, we then requested they briefly describe why this location was special. Table 12 below provides a summary of the most frequently cited attributes of boaters' favorite location. Aside from Lakeshore Property Owners' mention of ownership, lower levels of boat traffic, water conditions and peace and quiet were attributes often mentioned.

Table 12. Attributes of Boaters' Favorite Locations on Lake Austin. (x) = number of mentions

Most Mentioned Attributes	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	Less traffic (5)	Own the property (81)	Less traffic (10)
2.	Memories of times past (3)	Peace and quiet (28)	Water conditions (10)
3.	Fishing (2)	Less traffic (27)	Swimming (9)
4.	Peace and quiet (3)	Water conditions (17)	Family gatherings (8)
5.	Water conditions (2)	Scenic beauty, views (16)	Relax/unwind (5)
6.		Convenient access (11)	Coves (4)
7.		Swimming (9)	Friends and socializing (4)
8.		Family gatherings (8)	Parks and picnicking (4)
9.		Friends and socializing (7)	This lake is a safe place (4)
10.		Memories of times past (7)	Memories of time past (4)

B. Intensity of Attachment to Favorite Locations

We also used a scale[5] to measure the extent of respondents' attachment to their favorite location on Lake Austin. This scale captures respondents' attachment across four dimensions of place attachment: (a) *place dependence* – reflects the extent to which boaters are dependent on the setting for providing valued experiences, (b) *social bonding* – examines the extent to which boaters' ties to their favorite site are grounded in friendships, (c) *place identity* – examines the extent to which boaters' favorite locations

[5] See Kyle, Mowen & Tarrant (2004) in references for publication information about this scale.

(and the lake) are part of their self identity, and (d) *affective attachment* – reflects the degree to which boaters are emotionally attached to their favorite site.

As displayed in Table 13, we report the means for the individual scale items and their composite mean (i.e., average of the combined items associated with that dimension) for each dimension. Across the dimensions, we observed some variation on respondents' scores for *place dependence* (*M* range 3.2 to 3.9), *social bonding* (*M* range 3.6 to 4.1) and *affective attachment* (M range 3.3 to 4.2). We observed the largest variation among the boating groups with regard to the extent they identified with their favorite location (i.e., *place identity*) on Lake Austin[6]. Lakeshore Property Owners indicated a significantly stronger identity with their favorite place on the lake (*M*=3.8) than either Boat Ramp Users (*M*=3.0) or Private Marinas Users (*M*=2.8). Though this was the only significant difference, Lakeshore Property Owners had the highest mean scores on all four dimensions. This finding might be expected given that that these respondents have lived on the lake an average of 15 years and have been boating longer than any other group. Groups with high levels of place attachment, like these Lakeshore Property Owners, are often those most passionate about changing resource conditions and are the most likely to become active in management issues.

Table 13. Boaters' Attachment to their Favorite Locations on Lake Austin

(*Mean*)[1]	**Boat Ramp Users**	**Lakeshore Owners**	**Private Marinas**	**Overall**
Place Dependence	3.2	3.9	3.3	3.7
My favorite place in Lake Austin is the best lake for the activities that I enjoy most	3.9	4.0	3.8	4.0
I can't imagine a better place for what I like to do	2.9	3.8	3.0	3.6
I feel that a lot of other places could substitute for my favorite place.	2.8	3.7	3.1	3.5
Social Bonding	3.8	4.1	3.6	4.0
I associate special people in my life with Lake Austin	3.4	3.9	3.1	3.7
The time spent boating on Lake Austin allows me to bond with my family and friends	4.0	4.0	3.6	3.9
I have a lot of fond memories of past experiences with family and friends on Lake Austin	4.0	4.3	4.0	4.2
Place Identity	3.0	3.8	2.8	3.6
I feel Lake Austin is a part of me	2.8	3.8	2.8	3.5
I feel a strong sense of belonging to Lake Austin	3.0	3.8	2.8	3.6
I identify with Lake Austin	3.2	3.9	2.8	3.6
Affective Attachment	3.8	4.2	3.3	4.0
I have a strong emotional bond to Lake Austin	3.4	4.0	3.2	3.8
I really enjoy my favorite place	4.2	4.3	3.7	4.2
My favorite place means a lot to me	3.8	4.1	3.1	3.9

[1] Response categories: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

[6] Place identity: F= 23.8, df= 2, 319, *p*= 0.000.

C. Locations Boaters Spent Most Time

During their exit interviews, we asked Boat Ramp Users to identify on a map of Lake Austin locations where they spent time on this visit. Figure 5, presents a map of the service areas illustrating locations on the lake where respondents visited most often. Boat Ramp Users most often visited the central eastern end of the lake in Service Area/Zone 3. Service Area/Zones 1 and 4 were also visited at a fairly high rate. Boat Ramp Users were least likely to visit Zone 2 on this trip.

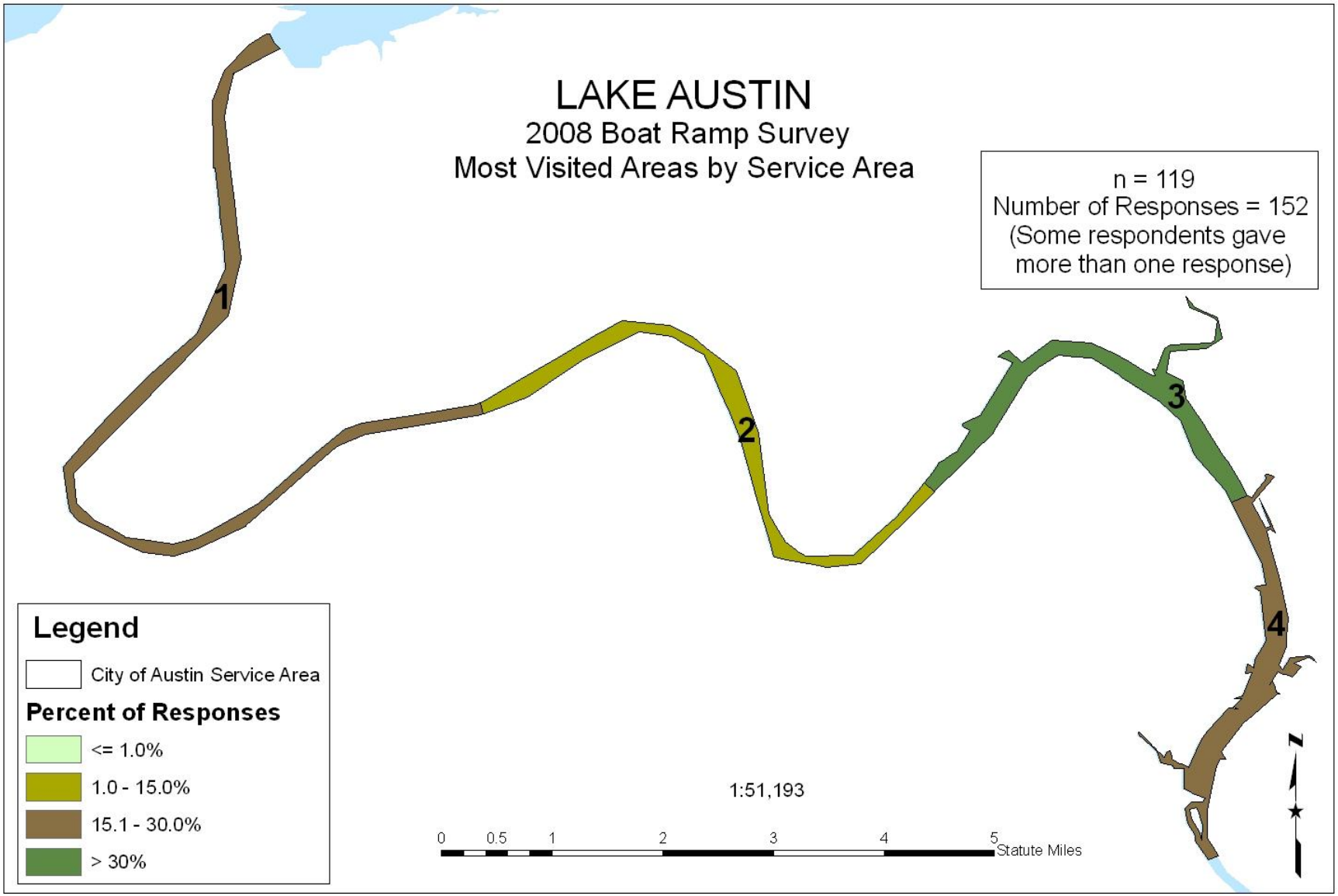

Figure 5. Boat Ramp Users' Locations where they visited most often by service area

D. Locations Boaters Avoided

We also asked Boat Ramp Users to identify on a map of Lake Austin locations of areas they avoided on this visit. Figure 6 is a map of each of the service area/zones illustrating locations on the lake respondents indicated avoiding. In spite of being areas that many Boat Ramp Users cited as being their favorite and spending most of their time, Service Area/Zone 3 was most frequently cited as containing the most areas they avoided.

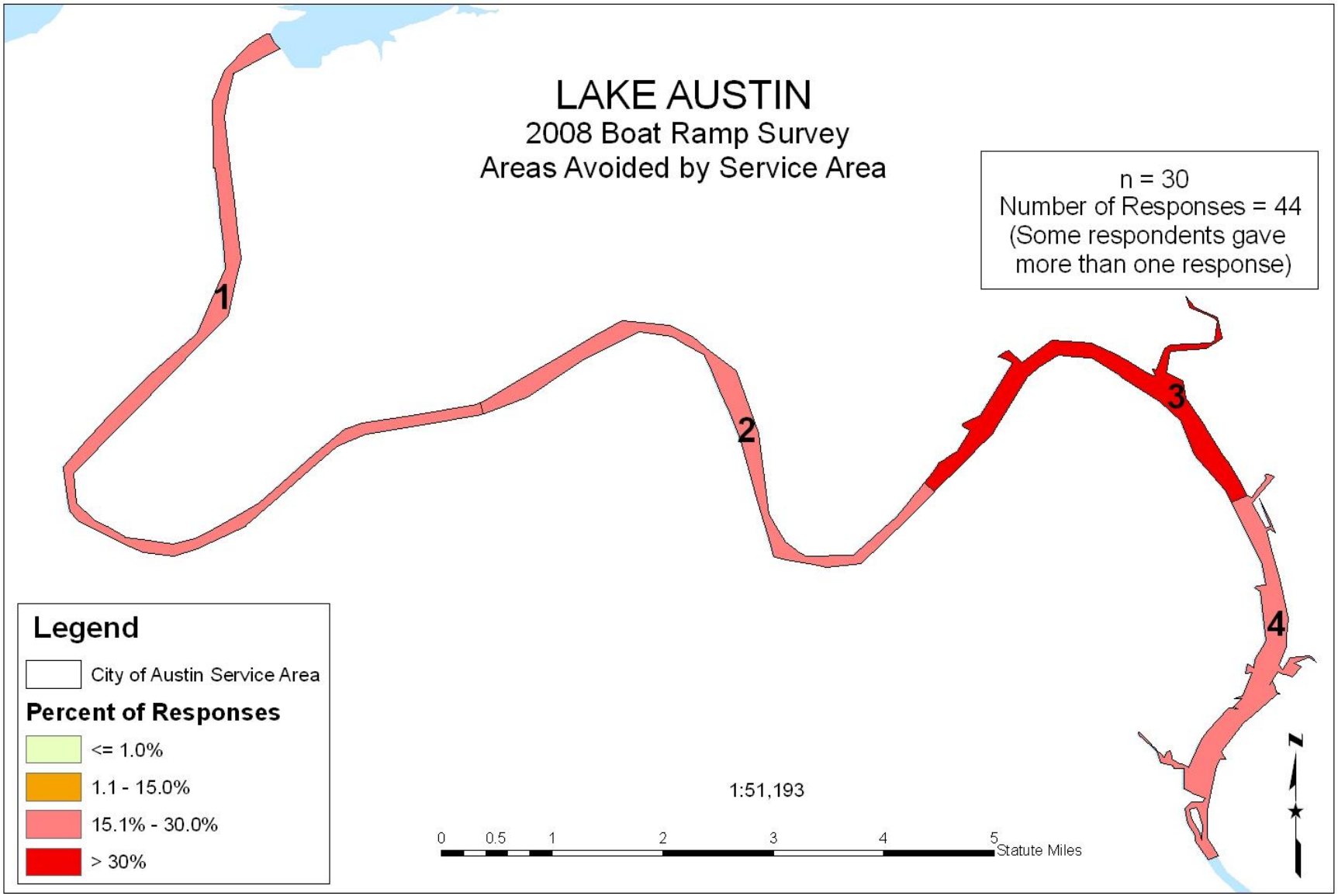

Figure 6. Boat Ramp Users' Locations Avoided by Service Area/Zone

In the follow-up/mailback surveys respondents were also asked to provide names of the areas they avoided. Table 14 below provides a summary of the most frequently reported areas that respondents avoided. As with the information conveyed on the map, there are several places indicated by some respondents as places they most like while others seem to most often avoid those same places. For example, the 360 Bridge was cited most often by all three groups as a place to avoid but the bridge also showed up among all three user groups as a favorite place.

Table 14. Places Most Often Avoided on Lake Austin. (x) = number of mentions

Most Avoided Places	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	360 Bridge (8)	360 Bridge (35)	360 Bridge (7)
2.	Hula Hut (5)	City Park (28)	Mansfield or Miller Dam (6)
3.	City Park (3)	Tom Miller dam (13)	Restaurants like Hula Hut (6)
4.	High traffic areas (3)	Bull Creek (11)	Bulkhead/retaining wall (4)
5.	Main body of lake (2)	Boat Ramps (10)	City Park (4)
6.	Mansfield Dam (2)	Hula Hut (10)	Coves (4)
7.	Shallow/sand bar areas (2)	Dam (9)	High traffic area (3)
8.		High traffic areas (9)	Bull Creek (2)
9.		Coves (8)	Mt. Bonnell (2)
10.		Ski Shores (7)	Westwood Country Club (2)

E. Locations Boaters felt Unsafe

During their exit interviews, we asked Boat Ramp Users to identify on a map of Lake Austin locations they felt unsafe on this visit. Figure 7 is a map of the service areas/zones illustrating locations on the lake respondents indicated feeling unsafe. Consistent with an area boaters' cited as one they avoid, they also cited Zone 3 as an area they did not feel safe. However, Zone 2 – North Shore to Ski Shores - also included a high proportion of "unsafe" responses, though it was not one they were as likely to avoid.

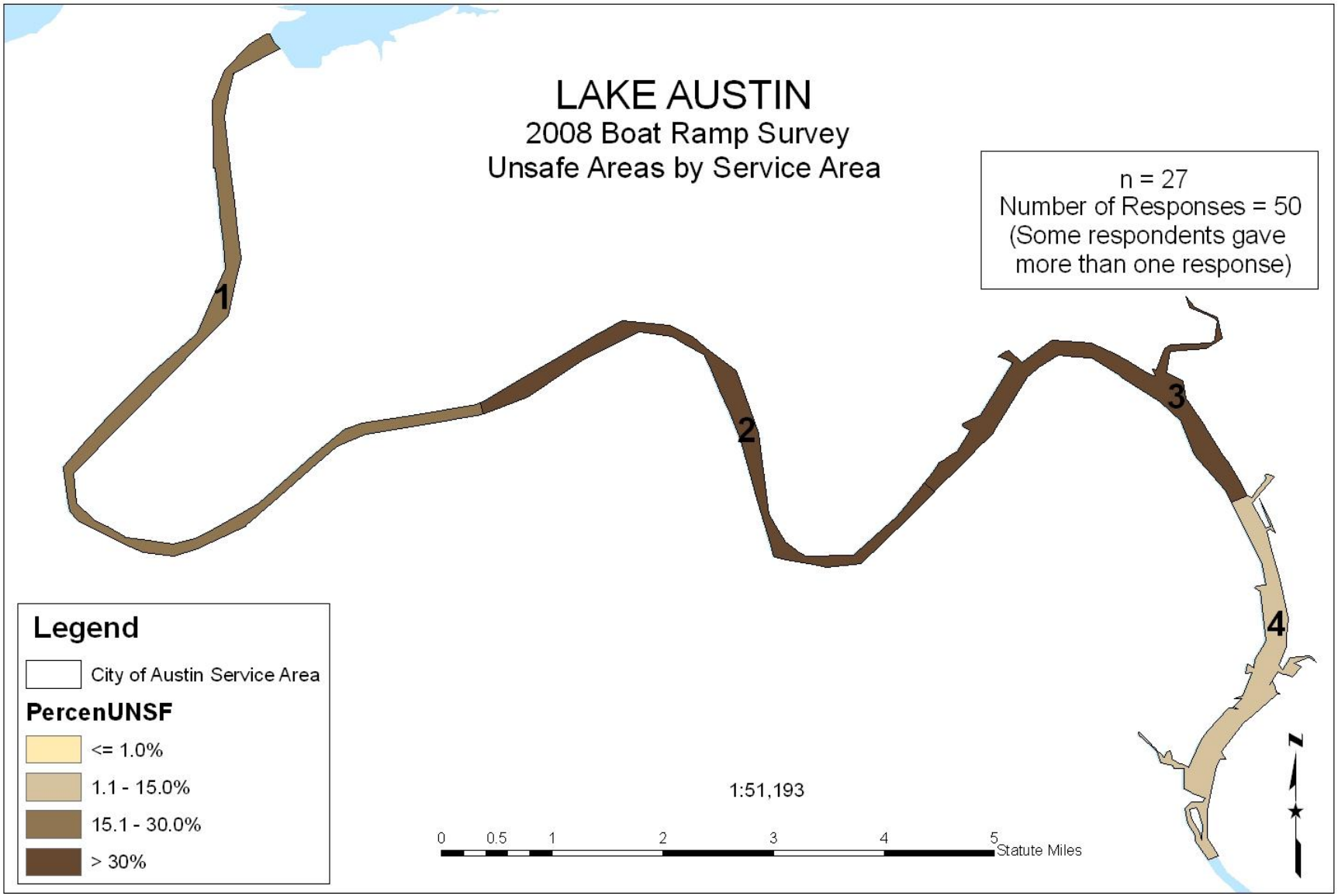

Figure 7. Boat Ramp Users' Locations where they Felt Unsafe by Service Area

F. Elements Boaters Liked *Best/Least* About their Visit

We asked all respondents in the follow-up/mailback surveys to indicate what they liked *best* and *least* about their visits to the lake for the 2008 boating season. We report in Table 15 and 16 below summaries of the features respondents like *best* and *least.* Water conditions and the beauty of the lake were commonly cited features respondents liked. Family time, relaxing and socializing were also frequently mentioned as "best" features.

All three groups of respondents indicated that crowdedness was the feature they liked least about their visits to Lake Austin. Loud music, large wakes and reckless or disrespectful boaters were also mentioned often as dislikes. The issue of crowded conditions is addressed more specifically in the next section.

Table 15. Features Liked Best. (x) = number of mentions

Best Feature	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	Water conditions (8)	Beauty, scenery, view (52)	Beauty, scenery, view (16)
2.	Beauty, scenery, view (6)	Water sports (44)	Water conditions (15)
3.	Family time (5)	Family time (40)	Being on the water (10)
4.	Fishing (5)	Peace and quiet (35)	Family time (10)
5.	Fun and enjoyment (5)	Relaxing, destressing (28)	Relaxing, destressing (10)
6.	Access or convenience(4)	Friends and socializing (25)	Water sports (10)
7.	Water sports (4)	Water conditions (23)	Friends and socializing (9)
8.	Being out in nature (3)	Being on the water (22)	Fun and enjoyment (8)
9.		Being out in nature (21)	Access or convenience (6)
10.		Boating, cruising, sight-see (19)	

Table 16. Features Liked Least. (x) = number of mentions

Worst Feature	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	Crowded conditions (16)	Crowded conditions (80)	Crowded conditions (37)
2.	Large wakes (11)	Loud music (79)	Large wakes (20)
3.	Loud music (5)	Large wakes (77)	Reckless boaters (7)
4.	Crowded/chaotic ramps (3)	Loud boat motors (46)	Hydrilla, duckweed (6)
5.	Drunks on lake (2)	Reckless boaters (25)	Loud music (6)
6.	Disrespectful boaters (2)	Hydrilla, duckweed (22)	Inexperienced boaters (4)
7.	Limited restaurants (2)	Weekends or holidays (21)	Jet skis (4)
8.	Partiers (2)	Jet skis (15)	Speeding (4)
9.	Water conditions (choppy) (2)	Larger boats (15)	Weekends or holidays (4)
10.		Profanity (10)	

G. Boaters' Perceptions of Setting Density

In both the onsite and the follow-up/mailback surveys, respondents were presented with a series of items examining their perceptions of setting density on Lake Austin (see Table 17 below). These items examined their perceptions of encountering others on the lake, their evaluation of these encounters and its impact on their boating experience, and their overall evaluation of setting density. With regard to boaters' *evaluation of the 2008 season*, overall, responses to these items ranged from "neutral" (M=3.4) to some sensitivity to the number of users (M=4.0 and M=5.9), indicating that the presence of others may have had some impact on experiences. When we examined individual use groups, we found no significant variations in sentiment among these groups.

Boat Ramp Users were also requested (onsite) to provide an assessment of the boating conditions (i.e., level of crowding) encountered at the launch ramp, on the lake while boating, along the shoreline, and the exit ramp (presented in the bottom half of Table 17). Overall, their onsite evaluations of setting density were more favorable than their mailback responses relating to the 2008 season. They were also required to evaluate crowding levels at different points throughout their boating experience; at the boat ramp at the launch of their day out, the lake while boating, the shoreline, and the boat ramp exiting the lake. At all points, Boat Ramp Users indicated low levels of crowding (*M* range: 2.8 to 4.1). Of the four areas specified, however, crowding was highest while out on the lake boating.

Last, Boat Ramp Users were requested, onsite, to assess their perceptions of safety in light of the *number of boats* on the lake and the *behavior* of other boaters. For both questions, respondents indicated feeling relatively safe ($M \geq 4.1$).

As displayed in Table 18, different boater groups were similar in the ways they responded to questions about numbers of people on Lake Austin and crowding during the 2008 season. The only question that resulted in a significant difference among perceptions dealt with how the number of people might have influenced enjoyment of visits to the lake. Lakeshore Owners' mean of 3.8 was significantly higher than the mean values for Boat Ramp Users (x=3.5) and Private Marina Slip Tenants (x=3.6). This suggests that the enjoyment of Lakeshore Owners was more negatively influenced by the number of people seen than for the other two groups (F=3.26, df=2, 465, p=.039).

Table 17. Boaters' Perceptions of Setting Density (summary)

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
How do you feel about ***the number of people*** you encountered on your visits to Lake Austin for the 2008 season?[1]	3.8	4.0	3.9	4.0
How did ***the number of people you saw*** on the lake compare with what you expected to see on your visits to Lake Austin for the 2008 season?[2]	3.3	3.4	3.2	3.4
How did ***the number of people you saw*** affect your overall enjoyment of your visits to Lake Austin for the 2008 season?[3]	3.5	3.8	3.6	3.7
Using the following scale, how would you describe the boating conditions out on the lake during your visits to Lake Austin for the 2008 season?[4] (presented to all in follow-up/mailback survey)	5.4	6.0	5.7	5.9
How did **the number of people you saw** at the lake **today** compare with what you expected to see?[5, 2]	2.9	n/a	n/a	2.9
How did **the amount of use** at the lake **today** affect your overall enjoyment of your visit?[5, 3]	2.8	n/a	n/a	2.8
Using the following scale, how would you describe the boating conditions at each of the following areas during your visit to Lake Austin? (presented onsite to Boat Ramp Users)				
i. At the launch ramp/marina at the start of your trip	2.8	n/a	n/a	2.8
ii. Out on the lake while boating	4.1	n/a	n/a	4.1
iii. Along the shoreline areas that you used	3.7	n/a	n/a	3.7
iv. At the launch ramp/marina when you stopped boating	3.9	n/a	n/a	3.9
In light of the number of boats you saw on the lake today, please rate how safe you felt while boating[6]	4.1	n/a	n/a	4.1
In light of the behavior of other boaters on the lake today, please rate how safe you felt while boating[6]	4.1	n/a	n/a	4.1

[1] Response categories: 1=Would like to have seen a lot more people, 2=Would like to have seen a few more people, 3=Neither too many nor too few people, 4=Would like to have seen a few less people, 5=Would like to have seen a lot less people

[2] Response categories: 1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected, 6=I didn't really have any expectations

[3] Response categories: 1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment

[4] Response categories: 1=not at all crowded through 9=Extremely crowded

[5] This question was only presented to boaters onsite at public boat ramps.

[6] Response categories: 1=Not at all safe, 3=Moderately safe, 5= Extremely safe

To better assess respondents' perceptions of setting density, in Tables 19 through 20 below, we provide each of the use groups' frequency distributions for the items assessing boaters' perceptions of setting density.

For Boat Ramp Users, most (49%) indicated that they would like to have seen a few less people on Lake Austin while 23.5% indicated that they would prefer to have seen a "a lot less people." The number of people they saw on the lake was largely what they expected to see (66.3%). An equal percentage

(40.8%) of Boat Ramp Users indicated that the number of people seen on the lake had no effect on their level of enjoyment or that they detracted from their enjoyment. Last, for the most part, Boat Ramp Users did feel somewhat crowded by the presence of others on Lake Austin. A little over 64 percent (64.3% - response categories 6 through 9 combined) expressed moderate to extreme crowding. Almost 16% of boat ramp respondents scored conditions as an 8 or 9 ("extremely crowded").

Table 18. Boat Ramp Users' Perceptions of Setting Density (frequency)

	1	**2**	**3**	**4**	**5**
How do you feel about ***the number of people*** you encountered on your visits to Lake Austin for the 2008 season?(%)[1]	2.0	1.0	24.5	49.0	23.5
How did ***the number of people you saw*** on the lake compare with what you expected to see on your visits to Lake Austin for the 2008 season? (%)[2]	2.1	7.4	66.3	14.7	9.5
How did ***the number of people you saw*** affect your overall enjoyment of your visits to Lake Austin for the 2008 season? (%)[3]	4.1	1.0	40.8	40.8	13.3

	1	2	3	4	5	6	7	8	9
Using the following scale, how would you describe the boating conditions out on the lake during your visits to Lake Austin for the 2008 season?[4] (presented to all in follow-up/mailback survey) (%)	1.1	9.5	8.4	6.3	10.5	23.2	25.3	8.4	7.4

[1] Response categories: 1=Would like to have seen a lot more people, 2=Would like to have seen a few more people, 3=Neither too many nor too few people, 4=Would like to have seen a few less people, 5=Would like to have seen a lot less people

[2] Response categories: 1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected, 6=I didn't really have any expectations

[3] Response categories: 1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment

[4] Response categories: 1=not at all crowded through 9=Extremely crowded

A slight majority of Lakeshore Property Owners on Lake Austin indicated that the number of boaters seen on the lake for the 2008 season aligned with their expectations (55.9%) However, 35 percent indicated that the numbers seen were a least a little more than expected. A large percentage (69.5%) indicated that these encounters negatively impacted their experience (see Table 19 below). Just over 33 percent indicated that they "would like to have seen a few less people" and 36 percent indicated that they "would like to have seen a lot less people". Additionally, over 63 percent (63.6%) indicated that the number of people they saw on the lake "detracted a little" or "detracted a lot" (scored the item a 4 or 5) from enjoyment. As with Boat Ramp Users, Lakeshore Property Owners' indicated moderate to extreme levels of crowding. Almost 65 percent (64.8%) scored conditions on Lake Austin between 6 and 9, on a 9 point scale, indicating they felt boating conditions during 2008 were moderately to extremely crowded. Over 28 percent scored the conditions as an 8 or 9, "extremely crowded."

Table 19. Lakeshore Property Owners' Perceptions of Setting Density (frequency)

	1	2	3	4	5
How do you feel about ***the number of people*** you encountered on your visits to Lake Austin for the 2008 season?(%)[1]	1.6	2.8	26.1	33.5	36.0
How did ***the number of people you saw*** on the lake compare with what you expected to see on your visits to Lake Austin for the 2008 season? (%)[2]	2.6	6.4	55.9	15.0	20.1
How did ***the number of people you saw*** affect your overall enjoyment of your visits to Lake Austin for the 2008 season? (%)[3]	1.8	3.9	30.6	39.7	23.9

	1	2	3	4	5	6	7	8	9
Using the following scale, how would you describe the boating conditions out on the lake during your visits to Lake Austin for the 2008 season?[4] (presented to all in follow-up/mailback survey) (%)	3.0	4.2	6.3	8.7	13.2	20.4	16.2	16.8	11.4

[1] Response categories: 1=Would like to have seen a lot more people, 2=Would like to have seen a few more people, 3=Neither too many nor too few people, 4=Would like to have seen a few less people, 5=Would like to have seen a lot less people

[2] Response categories: 1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected, 6=I didn't really have any expectations

[3] Response categories: 1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment

[4] Response categories: 1=not at all crowded through 9=Extremely crowded

Most Marina Slip Tenants indicated that while the number of boaters seen on Lake Austin for the 2008 season aligned with their expectations (61.5%), a good portion indicated that these encounters negatively impacted their experience (see Table 20 below). Almost 25 percent (24.4%) indicated that they "would like to have seen a few less people" and almost 14 percent (13.9%) indicated that they "would like to have seen a lot less people". Additionally, 45 percent indicated that the number of people they saw on the lake "detracted a little from my enjoyment" and a further 12.5 percent indicated that the number of people seen "detracted a lot from my enjoyment". The presence of boaters' had a moderate impact on Lakeshore Property Owners' perceived crowding; a) 15 percent indicated "not at all crowded" (response categories 1 and 2 combined), b) 30 percent indicated "slightly crowded" (response categories 3, 4 and 5 combined), c) 37.5 percent indicated "moderately crowded" (response categories 6 and 7 combined), and d) 17.5 percent indicated "extremely crowded" conditions (categories 8 and 9).

Table 20. Private Marina Slip Tenants' Perceptions of Setting Density (frequency)

	1	2	3	4	5
How do you feel about ***the number of people*** you encountered on your visits to Lake Austin for the 2008 season? (%)[1]	0.0	4.9	36.6	24.4	34.1
How did ***the number of people you saw*** on the lake compare with what you expected to see on your visits to Lake Austin for the 2008 season? (%)[2]	5.1	2.6	61.5	23.1	7.7
How did ***the number of people you saw*** affect your overall enjoyment of your visits to Lake Austin for the 2008 season? (%)[3]	7.5	2.5	32.5	45.0	12.5

	1	2	3	4	5	6	7	8	9
Using the following scale, how would you describe the boating conditions out on the lake during your visits to Lake Austin for the 2008 season?[4] (presented to all in follow-up/mailback survey) (%)	10.0	5.0	10.0	10.0	10.0	15.0	22.5	10.0	7.5

[1] Response categories: 1=Would like to have seen a lot more people, 2=Would like to have seen a few more people, 3=Neither too many nor too few people, 4=Would like to have seen a few less people, 5=Would like to have seen a lot less people

[2] Response categories: 1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected, 6=I didn't really have any expectations

[3] Response categories: 1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment

[4] Response categories: 1=not at all crowded through 9=Extremely crowded

H. Boaters' Perceptions of Lake Conditions

In the follow-up/mailback survey, we asked all respondents to rate the conditions they encountered on Lake Austin for the 2008 boating season (see Table 21). Overall, respondents tended to rate most items as a "slight problem". Items that approached a more serious level (i.e., a "moderate problem") were; (a) "unsafe operation of personal watercraft" (*M*=2.8), (b) "unsafe operation of vessels" (*M*=2.6), and (c) "people being inconsiderate" (*M*=2.5). The scores on these items reflect many of the open ended responses presented earlier in Table 21 as respondents indicated reckless and disrespectful boaters and noise/loud music as some of the things they liked least about their visits to the lake.

Across boating groups, Lakeshore Property Owners were generally the most critical in their evaluation of lake conditions, following by Private Marina Slip Tenants and then Boat ramp Users.

Table 21. Boaters' Perceptions of Lake Conditions (summary)

Lake Condition Items	Boat Ramp Users[1]	Lakeshore Owners	Private Marinas	Overall
Litter on beaches and shoreline	2.1	2.4	1.9	2.3
Poor water quality	1.8	2.0	2.1	2.0
Unsafe operation of personal watercraft	2.8	2.9	2.7	2.8
Insufficient navigational aids on the lake	1.7	1.8	1.6	1.8
Improper disposal of human waste	1.3	2.0	1.4	1.8
Too much noise on the lake	2.1	2.9	2.1	2.7
People being inconsiderate	2.8	2.7	2.3	2.7
Conflicts with other boaters for shoreline space	1.8	1.7	1.7	1.7
Conflicts with docks over shoreline space	1.7	1.6	1.5	1.6
Debris at launch ramps.	2.3	2.1	1.7	2.0
Inadequate toilet facilities on the lake	2.4	2.5	2.4	2.5
Erosion of shoreline	2.0	2.8	1.8	2.5
Unsafe operation of vessels	2.7	2.8	2.5	2.7

[1] Response categories: 1=Not a problem, 2=Slight problem, 3=Moderate problem, 4=Big problem

Boat Ramp Users seemed to be most concerned with four conditions on the lake. Inconsiderate and unsafe boaters (including PWC users) represented the top three problem conditions. Many (54%) also indicated that inadequate toilet facilities were at least a "moderate problem" on Lake Austin.

Table 22. Boat Ramp Users' Perceptions of Lake Conditions (frequency)

Lake Condition Items	Not a problem[1]	Slight problem	Moderate problem	Big problem
Litter on beaches and shoreline	24.4	48.8	19.5	7.3
Poor water quality	43.9	41.5	7.3	7.3
Unsafe operation of personal watercraft	14.6	24.4	31.7	29.3
Insufficient navigational aids on the lake	56.1	22.0	14.6	7.3
Improper disposal of human waste	76.3	18.4	2.6	2.6
Too much noise on the lake	36.6	34.1	14.6	14.6
People being inconsiderate	17.1	26.8	17.1	39.0
Conflicts with other boaters for shoreline space	52.5	20.0	20.0	7.5
Conflicts with docks over shoreline space	57.9	15.8	26.3	0
Debris at launch ramps.	22.0	34.1	31.7	12.2
Inadequate toilet facilities on the lake	28.2	30.8	15.4	25.6
Erosion of shoreline	39.5	36.8	7.9	15.8
Unsafe operation of vessels	19.5	26.8	19.5	34.1

[1] Response categories: 1=Not a problem, 2=Slight problem, 3=Moderate problem, 4=Big problem

Mean scores indicated that Lakeshore Property Owners felt that nine of the thirteen conditions were more problematic. Table 23 below indicates that this group, like ramp users, was concerned about unsafe operation of vessels/PWC and inconsiderate boaters, however, their highest levels of concern were for conditions related to noise (65% "moderate" or "big problem") and shoreline erosion (61% "moderate" or "big problem"). The "problem" percentages for Ramp and Marina Slip Tenants were almost exactly reversed for these two items, suggesting that Lakeshore Property Owners' perceptions of conditions were very different from the other two user groups in these ways.

Table 23. Lakeshore Property Owners' Perceptions of Lake Conditions (frequency)

Lake Condition Items	**Not a problem**[1]	**Slight problem**	**Moderate problem**	**Big problem**
Litter on beaches and shoreline	15.5	41.1	16.9	16.5
Poor water quality	35.4	33.9	22.3	8.5
Unsafe operation of personal watercraft	11.3	24.8	27.3	36.7
Insufficient navigational aids on the lake	52.3	21.2	18.0	8.5
Improper disposal of human waste	47.0	24.2	14.4	14.4
Too much noise on the lake	13.8	20.4	23.8	42.0
People being inconsiderate	17.1	24.1	27.6	31.3
Conflicts with other boaters for shoreline space	55.0	23.3	14.1	7.6
Conflicts with docks over shoreline space	66.2	14.3	12.0	7.5
Debris at launch ramps.	35.0	35.0	18.0	12.0
Inadequate toilet facilities on the lake	26.6	21.1	25.4	27.0
Erosion of shoreline	26.4	12.3	20.2	41.1
Unsafe operation of vessels	13.4	26.4	27.4	32.8

[1] Response categories: 1=Not a problem, 2=Slight problem, 3=Moderate problem, 4=Big problem

Marina Slip Tenants felt most of the 13 conditions were only slight problems at most. As with other groups, the condition that appeared to be the biggest problem was unsafe operation of PWCs.

Table 24. Private Marina Slip Tenants' Perceptions of Lake Conditions (frequency)

Lake Condition Items	**Not a problem**[1]	**Slight problem**	**Moderate problem**	**Big problem**
Litter on beaches and shoreline	44.6	30.4	17.4	7.6
Poor water quality	37.2	33.0	16.0	13.8
Unsafe operation of personal watercraft	13.4	29.9	33.0	23.7
Insufficient navigational aids on the lake	56.8	27.4	13.7	2.1
Improper disposal of human waste	75.3	13.6	8.6	2.5
Too much noise on the lake	34.4	32.3	18.8	14.6
People being inconsiderate	26.0	29.2	29.2	15.6
Conflicts with other boaters for shoreline space	54.4	31.1	7.8	6.7
Conflicts with docks over shoreline space	67.4	20.9	8.1	3.5
Debris at launch ramps.	51.2	29.8	13.1	6.0
Inadequate toilet facilities on the lake	28.6	23.1	30.8	17.6
Erosion of shoreline	47.6	29.8	19.0	3.6
Unsafe operation of vessels	18.3	37.6	21.5	22.6

[1] Response categories: 1=Not a problem, 2=Slight problem, 3=Moderate problem, 4=Big problem

I. Boaters' Motives

Table 25 below presents data on boaters' motives for boating on Lake Austin. In the follow-up/mailback questionnaire, we listed a number of potential reasons for boating on Lake Austin and asked respondents to indicate the degree to which these factors were important for their boating experience and the extent to which they were able to enjoy (i.e., "attain") these elements[7]. In the data below, we

[7] This scale was adapted from Driver, Tinsley & Manfredo (1991).

provide the mean for each item, in addition to the composite mean for each dimension of motivation (i.e., *nature, tranquility, learning,* etc.).

Overall, with the exception of "introspection" (*M*=2.4) and "learning" (*M*=2.6), all other dimensions of motivation were rated "moderately important" or higher. Respondents' ability to enjoy these elements approximated the degree to which they considered these elements important. The largest disparity (i.e., important to attainment ratio) was for the item "to experience solitude". Respondents' mean importance rating for this item was 3.0, yet their ability to enjoy solitude (i.e., attain), was somewhat less with a mean rating of 2.4.

Across groups, the pattern of importance to attainment scores was relatively consistent. Significant differences in importance ratings across groups were, however, observed for the Nature and Physical Fitness motivation dimensions. Lakeshore Owners scored the importance of experiencing nature at the lake significantly higher than either Marina Slip Tenants or Boat Ramp Users. Lakeshore Property Owners and Boat Ramp Users both scored the importance of motivations related to physical fitness significantly higher than scores of Private Marina Slip Tenants. However, for most lake use motivations, be it importance or attainment, there was no significant difference in the way groups scored the dimensions. The lack of variation suggests that different types of users are attaining benefits (at least the dimensions measured here) at the same levels. Physical Fitness, Social Bonding, experiencing Nature and Escape were the four most attained benefits related to a Lake Austin experience during the 2008 season.

For the individual items, factors that respondents considered important to their boating experience with mean of 3.4 or higher were:

- "To enjoy the scenery" (overall *M*=3.7),
- "To get away from the usual demands of life" (overall *M*=3.6),
- "To do something with the family" (overall *M*=3.5) and,
- "To relax physically" (overall *M*=3.4).

Each of these items has a direct management implication. The importance of scenery implies the need to maintain the environmental condition of the lake. With regard to relaxation, for some this can occur in the midst of large groups of friends whereas for others it may relate to enjoying less used areas of the lake. Regardless, ensuring that opportunities for socialization or escape remain available will be important for the servicing of diverse recreational interests.

Table 25. Motives

	Boat Ramp Users		Lakeshore Owners		Private Marinas		Overall	
(Mean)[1, 2]	*Imp*	*Att*	*Imp*	*Att*	*Imp*	*Att*	*Imp*	*Att*
Nature[a]	2.8	2.6	3.1	2.7	2.8	2.7	3.0	2.7
To be close to nature	2.9	2.6	3.3	2.8	3.1	2.9	3.2	2.8
To view wildlife	2.4	2.5	2.9	2.7	2.3	2.4	2.7	2.7
To enjoy the scenery	3.5	3.5	3.7	3.4	3.5	3.1	3.7	3.3
To experience natural quiet	2.3	2.4	2.5	2.2	2.6	2.6	2.5	2.3
To experience solitude.	2.7	2.3	3.1	2.4	2.7	2.1	3.0	2.4
Learning	2.7	2.7	2.5	2.6	2.6	2.6	2.5	2.6
To learn more about nature	2.1	2.0	2.6	2.4	2.0	2.2	2.4	2.3
To develop my skills and abilities	2.8	2.9	2.3	2.5	2.7	2.7	2.4	2.6
To use my equipment	3.3	3.3	2.7	2.9	3.0	3.0	2.8	3.0
Physical Fitness[a]	3.1	3.0	3.1	2.8	2.7	2.7	3.0	2.8
To feel healthier	3.0	2.9	2.9	2.7	2.8	2.9	2.9	2.8
To get exercise	2.9	2.9	2.7	2.7	2.4	2.4	2.7	2.6
To relax physically	3.6	3.3	3.5	3.1	3.0	2.8	3.4	3.1
Social Bonding	2.9	2.9	2.9	2.8	2.9	2.8	2.9	2.8
To do something with the family	3.4	3.3	3.6	3.4	3.1	2.9	3.5	3.3
To share what I have learned with others	2.5	2.3	2.5	2.5	3.1	2.5	2.7	2.5
To be with people who enjoy the same things I do	3.3	3.3	3.2	3.1	3.4	3.2	3.3	3.1
To be with members of my group	3.2	3.3	3.2	3.1	3.3	3.3	3.2	3.1
To meet new people	1.9	2.0	1.7	1.9	1.9	2.3	1.8	2.0
Escape	3.0	2.9	2.9	2.7	2.9	2.6	2.9	2.7
To be away from other people	2.4	2.3	2.2	2.2	2.2	2.3	2.2	2.3
To get away from the usual demands of life	3.7	3.5	3.6	3.2	3.5	2.8	3.6	3.2
Introspection	2.4	2.5	2.3	2.4	2.1	2.4	2.2	2.4
To think about my personal values	2.1	2.3	2.3	2.4	1.7	2.1	2.2	2.3
To challenge myself	2.6	2.7	2.2	2.4	2.4	2.6	2.3	2.5

Note. Different superscripts indicate significant difference across boating groups. We use lower case for importance comparisons and upper case for attainment comparisons.

[1] Importance (*Imp*) response categories: 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important

[2] Attainment (*Att*) response categories: 1-Did not attain, 2=Somewhat attained, 3=Moderately attained, 4=Totally attained

J. Boaters' Evaluation of their Experience

All respondents were presented with a series of items that focused on boaters' experience on Lake Austin. We grouped these items into six common themes[8]:

- *Boat Encounters:* Items relate to boaters' encounters/observation of other uses of the lake,
- *Interpersonal Conflict:* Items examine boaters' conflicts with others users of the lake,

[8] Exploratory factor analysis (principal axis with varimax rotation) was conducted to categorize items into common themes.

- *Level of Enjoyment:* Items focus on boaters' level of enjoyment with their Lake Austin boating experience,
- *Behavior of other Boaters:* Items focus on the behavior of other boaters,
- *Environmental Quality:* Items focus on the physical condition of the lake, and
- *Structural Constraints:* Items examine factors that potentially constrain boaters' use of the lake.

Table 26 suggest that, overall, the conditions on Lake Austin for the 2008 boating season were somewhat favorable. Overall, the means hovered around neutral (i.e., ~3.0) for items focusing on respondents' encounters with other boaters (*boat encounters*), conflict with other boaters (*interpersonal conflict*), and respondents thoughts on the behavior of other boaters (*behavior of other boaters*). This implies that, among the sample as a whole, some boaters: (a) encountered situations that they were not comfortable with, (b) adjusted their use spatially (e.g., avoiding favored areas of the lake) and/or temporally (e.g., adjusting the time of the boating) to avoid situations they did not enjoy or were potentially dangerous, and (c) witnessed dangerous behavior. In spite of this, boaters' overall *level of enjoyment* was very high and they expressed a strong intention to return. Their evaluation of the physical condition of the lake (*environmental quality)* was also relatively positive. Last, they indicated that the weather and fuel prices were not major constraints to their decision to boat.

As with our other indicators examining the lake's physical and social condition, Lakeshore Property Owners were generally more critical of conditions on the lake. Private Marina Slip Tenants were closer to Lakeshore Property Owners than Boat Ramp Users in their evaluation of the lakes' physical and social condition. This pattern was most strongly reflected in the *boat encounter* and *interpersonal conflict,* factors. The items with the highest level of agreement suggested that all three user types stay off the lake at some parts of the day due to "too many boats" (x=3.9). All users also generally agreed that high use areas involved too much risk (x=3.7) and that other boaters throw large wakes (x=3.7). Lakeshore Property Owners had the highest agreement scores on both the risk and throwing large wake items.

However, there was consensus related to *behavior of other boaters*, *level of enjoyment,* perceptions of *environmental quality,* and *structural constraints* factors – with all expressing enjoyment and an intention to revisit, all indicating the lake was in good condition, and all mildly constrained by fuel prices.

Table 26. Boaters' Evaluations of Their Experiences on Lake Austin

(Mean)[1]	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Boat Encounters	2.9	3.2	2.9	3.1
I avoided my favorite parts of the lake because there were too many boats there	2.6	2.9	2.6	2.8
I stayed off the lake during parts of the day because there were too many boats on the lake	3.7	4.0	3.5	3.9
My boating trips were not as enjoyable as I expected them to be	2.6	2.6	2.4	2.6
There was an unsafe number of boats on the water	2.8	3.3	3.0	3.2
I was disappointed with some aspects of my boat trips	3.0	3.0	2.9	3.0
The number of boats on the lake reduced my enjoyment	3.1	3.5	3.2	3.4
I nearly had an accident on the lake because of crowded conditions	2.1	2.3	2.2	2.3
I did not participate in some boating activities because of crowded conditions at the lake	3.0	3.3	3.1	3.3
I saw more boats than I expected to see	3.3	3.5	3.2	3.4
I avoided some areas of the lake because of unsafe conditions I had previously experienced	3.2	3.2	2.9	3.2
Interpersonal Conflicts	3.1	3.4	3.1	3.3
Boating in high use areas involved too much risk	3.7	3.8	3.6	3.7
Engine noise from other boaters was too loud	2.3	3.4	2.7	3.1
Other boaters threw massive wakes	3.5	3.9	3.2	3.7
I witnessed reckless boating operations by other boaters (i.e., unsafe speeds, dangerous behaviors, etc.)	3.5	3.5	3.3	3.4
Other boaters delivered overly loud amplified music	2.7	2.6	2.6	2.6
Level of Enjoyment	3.2	3.1	3.1	3.1
I thoroughly enjoyed my boat trips for the 2008 season	4.0	3.8	3.9	3.9
I do not want to go on any more boat trips at this lake	1.5	1.5	1.5	1.5
My boat trips were well worth the money I spent to take them	4.0	3.8	3.7	3.8
If I had known what it was going to be like for the 2008 season, I would not have come to the lake	1.7	1.7	1.7	1.7
I intend to visit this lake again in the future	4.4	4.6	4.5	4.5
Boating conditions on the lake were safe	3.4	3.1	3.3	3.1
Behavior of Other Boaters	3.2	3.2	3.2	3.2
Other boats came closer to my boat than I like	3.4	3.4	3.3	3.3
I was bothered by personal watercraft cutting too close to my boat	3.1	3.1	3.2	3.2
The behavior of other boaters interfered with the quality of my boating experience	3.2	3.2	2.9	3.1
The presence of personal watercraft interfered with the quality of my boating experience	3.0	3.1	3.3	3.1
Environmental Quality	3.0	3.1	3.2	3.1
I thought the lake and its surroundings were in good condition	3.9	3.5	3.8	3.6
I was bothered by poor water quality (e.g., contaminants)	2.3	2.5	2.5	2.5

I encountered nuisance aquatic vegetation (e.g., extensive Hydrilla growth)	2.8	3.3	3.2	3.3
Structural Constraints	2.5	2.4	2.5	2.4
The weather was not favorable	2.3	2.2	2.4	2.3
High gas prices prevented me from boating	2.9	3.2	2.9	3.1

[1] Response categories: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

K. Commitment to Boating

In the follow-up/mailback survey, we asked all respondents to indicate their level of agreement with items examining their commitment to boating (see Table 27 below). These items can be divided into two sub-dimensions; *behavioral* and *personal*[9]. *Behavioral* commitment examines the degree to which boating occupies a central role in respondents' lives. Alternately, *personal* commitment refers to the extent to which respondents were emotionally invested in the activity.

In Table 27 below, we present the means for both the individual items in addition to the *behavioral* and *personal* dimensions (i.e., average of the items associated with each dimension). Overall, respondents' commitment to boating was modest. Given that their visit to Lake Austin encompasses many activities (e.g., fishing, swimming, etc.; see Table 8 above), these data lead us to believe that the activity "boating" may not be their primary reason for visiting Lake Austin; i.e., "boating" facilitates the enjoyment of other lake-based activities. Among the three groups examined here, Boat Ramp Users were the most committed to boating, consistently scoring behavioral and personal items higher than the other two groups.

Table 27. Respondents Commitment to Boating

(Mean)[1]	**Boat Ramp Users**	**Lakeshore Owners**	**Private Marinas**	**Overall**
Behavioral Commitment	2.7	2.2	2.1	2.2
If I stopped boating, I would probably lose touch with a lot of my friends	2.3	2.2	2.1	2.1
If I couldn't go boating, I am not sure what I would do	2.9	2.2	2.1	2.2
Most of my friends are in some way connected with boating	2.8	2.3	2.3	2.3
Personal Commitment	3.4	3.0	2.9	3.0
I find that a lot of my life is organized around boating	3.1	2.6	2.5	2.6
I consider myself to be somewhat of an expert at boating	3.8	3.7	3.7	3.7
Other leisure activities don't interest me as much as boating	3.3	2.6	2.6	2.7

[1] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

L. Boaters' Coping Responses to Adverse Elements

There are a number of factors that can potentially impact the publics' enjoyment of Lake Austin and their behavior while boating. Presented below in Table 28 are data illustrating how boaters responded

[9] The scale was adapted from Kim, S. S., Scott D., & Crompton, J. L. (1997).

to these factors. We requested respondents to indicate the degree to which each statement impacted their own behavior while boating[10]. These items can be categorized into seven dimensions:

1. *Temporal Substitution:* Refers to altering the timing of their boat outing to avoid certain conditions.
2. *Activity Substitution:* Refers to enjoying another activity other than boating in response to real or anticipated conditions.
3. *Resource Substitution:* Refers to changing the location of the boating experience – either at another location on Lake Austin or a nearby lake in response to real or anticipated conditions.
4. *Absolute Displacement*: Refers to cases where people completely stop boating in response to real or anticipated conditions.
5. *Direct Action:* Refers to situations where boaters attempt to alter the condition encountered; e.g., talking to authorities.
6. *Product Shift:* Refers to situations where boaters encounter conditions that were not anticipated and adjust their expectations for the experience accordingly.
7. *Rationalization:* Refers to situations where boaters encounter unanticipated conditions and alter their assessment of the condition.

At the dimensional level, respondents' use of strategies to minimize the impact of negative situations on their boating experience reflected a combination of behavioral change (e.g. *temporal substitution, M*=3.2) and cognitive adaptation (e.g., *rationalization, M*=2.7). As evidenced in the lower means, respondents tended not to adopt more extreme actions in response to adverse elements that involved choosing other activities (*activity substitution, M*=2.4) or alternate lakes (e.g., *absolute displacement, M*=1.5, and *resource substitution, M*=2.2).

At the item level, the most commonly employed strategies adopted in response to adverse situations were decisions to boat at different times of the day or to boat on weekdays rather than weekends (*M*=3.4).

The ways that boater groups tended to respond to changing conditions varied. For example, Boat Ramp Users were more likely to avoid certain locations or even change lakes to find better conditions. Lakeshore Property Owners were more likely to take "direct action" by talking to the authorities about problems and were less likely to shift their opinions about the appropriateness of changing conditions (i.e., "product shift"). These three coping strategies were those for which significant variation among the boating groups resulted:

a. *Resource substitution*[11]*:* Lakeshore Property Owners (*M*=2.2) vs. Boat Ramp Users (*M*=2.7) and Private Marina Slip Tenants (*M*=1.9),
b. *Direct Action*[12]*:* Lakeshore Property Owners (*M*=2.2) vs. Boat Ramp Users (*M*=1.8) and Private Marina Slip Tenants (*M*=1.7), and
c. *Product Shift*[13]*:* Lakeshore Property Owners (*M*=2.1) and Private Marina Slip Tenants (*M*=2.3) vs. Boat Ramp Users (*M*=2.4).

[10] This scale was adapted from Miller, T. A., & McCool, S. F. (2003).
[11] F=7.94, df=2, 465, *p*=0.000
[12] F=9.59, df=2, 455, *p*=0.000
[13] F=3.33, df=2, 460, *p*=0.007

Table 28. Boater's Coping Responses

(Mean)[1]	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Temporal Substitution	3.0	3.2	3.1	3.2
Decided that if I boated on Lake Austin in the future, I would boat at earlier and/or later times of the day	3.5	3.4	3.3	3.4
Decided that if I boated on Lake Austin in the future, I would boat on the weekdays rather than weekends	3.0	3.4	3.2	3.4
Realized that I could avoid the condition or situation in the future by boating on Lake Austin at a different time	3.2	3.3	3.3	3.3
Boated less or reduced my boating frequency	2.2	2.7	2.4	2.6
Activity Substitution	2.0	2.5	2.2	2.4
Planned to do other things besides boating	2.0	2.5	2.4	2.5
Realized that doing some other activity other than boating would allow me to avoid this obstacle	2.1	2.5	2.0	2.3
Resource Substitution	2.7	2.2	1.9	2.2
Decided I would come back at the same time, but would boat at another area of Lake Austin	2.4	2.0	1.9	2.0
Avoided certain locations (e.g., coves, bays, dams, or marinas)	3.0	3.0	2.5	2.9
Boated on nearby lakes (e.g., Lakes LBJ, Travis, or Buchanan)	2.6	1.5	1.4	1.6
Absolute Displacement	1.5	1.5	1.5	1.5
Planned not to return to Lake Austin	1.5	1.3	1.4	1.3
Felt frustrated and decided boating is no longer important to me	1.2	1.6	1.4	1.5
Left the area altogether	1.8	1.7	1.7	1.7
Direct Action	1.8	2.2	1.7	2.0
Talked to someone who could do something concrete about the problem	1.5	1.8	1.5	1.7
Decided to talk with lake authorities	1.6	2.0	1.4	1.8
Talked with other members of my group or someone about how I was feeling	2.4	2.7	2.2	2.6
Product Shift	2.3	2.1	2.4	2.2
Realized that the condition or situation I experienced was really suitable after all	2.2	2.3	2.5	2.3
Told myself it was unreasonable to expect that things should have been different at this location	2.6	2.3	2.7	2.4
Decided that the problem was a one-time occurrence	2.0	1.6	1.7	1.6
Decided that, for this location, the condition or situation was what it should be	2.7	2.3	2.6	2.4
Rationalization	2.6	2.8	2.7	2.7
Tried to view this condition or situation positively	2.7	2.7	2.8	2.7
Told myself that there was nothing I could do about it, so I just enjoyed the experience for what it was	2.7	2.8	2.9	2.8
Told myself the condition or situation was actually a symptom of some larger problem	2.5	2.9	2.4	2.7

Note. Different superscripts indicate significant difference across boating groups.

[1] Response categories: 1=Does not describe at all, 3=Moderately describes, 5=describes very well

M. Boaters' Perceptions of Change over the Past Five Years

We asked all respondents in the flow-up/mailback survey to indicate what they perceived were the positive and negative changes that had occurred on Lake Austin over the preceding five years. We report in Table 29 and 30 below, summaries of the most cited changes identified by respondents. It should be noted that overall, respondents mentioned many more negative changes than positive. We have provided only the top 10 negatives here. On the positive side, many users felt that programs to control carp and hydrilla were helping and changes were evident. Police patrols also received positive mentions for an increased and friendlier presence on the lake. There were a few respondents who felt the lake was less crowded. However, the most common negative change mentioned by all three user groups related to more boat traffic and crowding. Similar to the "dislike" items covered earlier in the report, negative changes also dealt with loud music (Lakeshore Property Owners), engine noise and large wakes behind boats.

Table 29. Positive Changes in Last Five Years. (x) = number of mentions

Positive Change	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	Less hydrilla and duckweed (5)	Carp/hydrilla program success (87)	Carp/hydrilla program success (26)
2.	Friendlier police patrols (1)	No positive changes (9)	Beautiful women on lake (1)
3.	Generally cleaner (1)	Better visibility of law enforcement (9)	Friendlier police patrols (1)
4.	Parks are better (1)	More families enjoying the lake (4)	Water quality is better (1)
5.	Jet ski restrictions and curfew (1)	Fewer drunk visitors (3)	Less crowded (1)
6.	Less crowded (1)	Better jet ski restrictions and curfew (3)	Better visibility of law enforcement (1)
7.	More families on lake (1)	Less crowded (3)	Lowering lake levels for vegetation control (1)
8.	New home building (1)	Water quality is better (3)	

Table 30. Negative Changes in Last Five Years. (x) = number of mentions

Negative Change	Boat Ramp Users	Lakeshore Owners	Private Marinas
1.	More traffic/crowds (10)	More traffic/crowds (60)	More traffic/crowds (23)
2.	Larger boats and speeding (2)	Loud music(44)	Closing gas stations (7)
3.	Larger wakes and building of bulkheads(2)	Larger wakes(37)	Encroaching development(6)
4.	Less crawfish; other wildlife impacts(2)	More algae, hydrilla, duckweed(37)	Bulkheads and retaining walls (5)
5.	Litter, trash, pollution and decreased water quality(2)	More engine noise(29)	Inexperienced boaters(4)
6.	More algae, hydrilla, duckweed(2)	Too many wakeboard boats(27)	More algae, hydrilla, duckweed(4)
7.	Too many wakeboard boats(2)	Shoreline erosion(21)	The Pier closed (4)
8.	Encroaching development(1)	Unsafe or reckless boaters(21)	Litter, trash & pollution (3)
9.	Inexperienced boaters(1)	Speeding(15)	Unsafe, reckless boaters (3)
10.	More engine noise(1)	Litter, trash, pollution(13)	

SECTION 4: Boaters' Management Preferences

A. Boaters' Perceptions of Regulations

In the follow-up/mailback survey we asked all respondents to indicate their level of support for regulations currently in place on Lake Austin, those that are currently implemented on other lakes across Texas, or have been previously requested by boaters on Lake Austin. For three of the items below, we observed significant variation in support for the regulations among the different boating groups. Consequently, the focus is on variations among the three groups on perceptions of noise and boat wakes.

a. Lakeshore Property Owners were significantly more supportive of regulating boaters and were more likely to disagree that the City of Austin "does a good job" of regulating boaters and informing the public.
b. Lakeshore Property Owners were more supportive of mufflers [14], regulating the volume of music[15] and prohibiting wake generating devices like plows[16] than the other two groups.
c. Over 75% of lakeshore property owners were at least "somewhat supportive" of regulating the volume at which music can be played on a boat, 54% were "strongly supportive."

The support that Lakeshore Property Owners showed for these regulations is in line with earlier opinions they expressed about noise and wake conditions influencing their experiences during the 2008 boating season. The average scores for all three groups were somewhat neutral on feelings about how well Austin officials regulate the lake and inform the public. That said, almost 40% of property owners on Lake Austin disagreed that the city "does a good job" with either regulating or informing the public about regulations. Marina Slip Tenants, on the other hand, were much more likely to agree that the City of Austin was doing a good job in both regulating boating use (45% agreed) and informing the public about regulations (51% agreed).

[14] F=9.45, df=2, 452, *p*=0.000
[15] F=16.54, df=2, 452, p=0.000
[16] F=19.49, df=2,452, p=0.000

Table 31. Boaters' Perception of Regulations (summary)

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Statewide regulations that lower noise levels on the lake by requiring mufflers on motor boats *(M)*[1]	3.1	3.9	3.4	3.7
Regulations on regulating music volume on boats *(M)*[1]	3.3	4.1	3.3	3.8
Prohibit fat sacks, plows and other wake generating devices *(M)*[1]	2.9	3.7	2.8	3.4
The City of Austin does a good job of regulating recreational boating use on Lake Austin *(M)*[2]	3.4	2.9	3.0	3.0
The City of Austin does a good job of informing the public of boating regulations on Lake Austin *(M)*[2]	2.8	2.9	3.3	3.0

[1] Response categories: 1=Strongly opposed, 2=Somewhat opposed, 3=Neutral, 4=Somewhat supportive, 5=Strongly supportive

[2] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Table 32. Boat Ramp Users' Perceptions of Regulations (frequency)

Regulation Items	Strongly oppose	Somewhat oppose	Neutral	Somewhat supportive	Strongly supportive
Statewide regulations that lower noise levels on the lake by requiring mufflers on motor boats *(%)*[1]	12.5	20.0	25.0	30.0	12.5
Regulations on regulating music volume on boats *(%)*[1]	10.0	25.0	12.5	32.5	20.0
Prohibit fat sacks, plows and other wake generating devices *(%)*[1]	**30.0**	**15.0**	**17.5**	**12.5**	**25.0**
The City of Austin does a good job of regulating recreational boating use on Lake Austin *(%)*[2]	2.6	15.4	30.8	46.2	5.1
The City of Austin does a good job of informing the public of boating regulations on Lake Austin *(%)*[2]	17.9	20.5	35.9	17.9	7.7

[1] Response categories: 1=Strongly opposed, 2=Somewhat opposed, 3=Neutral, 4=Somewhat supportive, 5=Strongly supportive

[2] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Table 33. Lakeshore Property Owners' Perceptions of Regulations (frequency)

Regulation Items	Strongly oppose	Somewhat oppose	Neutral	Somewhat supportive	Strongly supportive
Statewide regulations that lower noise levels on the lake by requiring mufflers on motor boats *(%)*[1]	7.8	11.9	11.2	21.9	47.2
Regulations on regulating music volume on boats *(%)*[1]	7.2	10.0	6.6	21.9	54.4
Prohibit fat sacks, plows and other wake generating devices *(%)*[1]	11.9	14.1	10.7	15.7	47.6
The City of Austin does a good job of regulating recreational boating use on Lake Austin *(%)*[2]	16.5	22.5	25.7	25.4	9.8
The City of Austin does a good job of informing the public of boating regulations on Lake Austin *(%)*[2]	16.7	22.4	24.3	24.6	12.0

[1] Response categories: 1=Strongly opposed, 2=Somewhat opposed, 3=Neutral, 4=Somewhat supportive, 5=Strongly supportive

[2] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Table 34. Private Marina Slip Tenants' Perceptions of Regulations (frequency)

Regulation Items	Strongly oppose	Somewhat oppose	Neutral	Somewhat supportive	Strongly supportive
Statewide regulations that lower noise levels on the lake by requiring mufflers on motor boats *(%)*[1]	6.3	22.1	20.0	25.3	26.3
Regulations on regulating music volume on boats *(%)*[1]	12.6	20.0	18.9	22.1	26.3
Prohibit fat sacks, plows and other wake generating devices *(%)*[1]	27.1	22.9	16.7	14.6	18.8
The City of Austin does a good job of regulating recreational boating use on Lake Austin *(%)*[2]	18.3	12.9	23.7	38.7	6.5
The City of Austin does a good job of informing the public of boating regulations on Lake Austin *(%)*[2]	10.6	18.1	20.2	28.7	22.3

[1] Response categories: 1=Strongly opposed, 2=Somewhat opposed, 3=Neutral, 4=Somewhat supportive, 5=Strongly supportive

[2] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

B. Boater Safety/Education

Respondents were asked if they had read, seen, or heard of the Lower Colorado River Authority's *Nobody's Waterproof* boating safety education campaign. A relatively small percentage (12.4%) indicated they had heard any advertising or promotion in the past year. Across boating groups, Lakeshore Property Owners were the least likely to say they had seen anything on the program (Table 35). Just over 40% of respondents had taken some sort of boater education class and all three groups were neutral but leaned toward agreeing that Lake Austin "is managed safely" (M=3.2). As might be suspected, given their support of regulating boat wakes, Lakeshore Property Owners were significantly more likely to agree that "wakes generated … are problematic" (M=3.7) while the other users groups were more neutral in their response.[17]

Table 35. Boaters' Safety and Education

	Boat Ramp Users	Lakeshore Owners	Private Marinas	Overall
Have you seen, read, or heard any advertising or promotion in the last 12 months for water or boating safety using the slogan "Nobody's Waterproof"? (%, (*n* yes))	22.2% (10)	8.2% (32)	14% (13)	12.4% (55)
If "yes", how did year, see or read about the campaign?				
Internet	0% (0)	0.3% (1)	0% (0)	0.2% (1)
Radio	13.3% (6)	1.5% (6)	3.4% (4)	2.9% (16)
TV	2.2% (1)	4.4% (17)	3.4% (4)	4.0%(22)
Billboard	2.2% (1)	1.5% (6)	0.9% (1)	1.5% (8)
Friend or family	2.2% (1)	1.3% (5)	0.9% (1)	1.5%(8)
Activities at the lake	4.4% (2)	1.3% (5)	0.9% (1)	1.3% (7)
Other (*n* top three)	0% (0)	1.2% (4)	2.7% (3)	1.3% (7)
Have you ever taken a boater education/safety class before? (% (*n* yes))	42.2% (19)	43.4% (169)	41.9% (49)	43.0% (237)
I feel Lake Austin is managed safely for recreational boating *(M)* [1]	3.3	3.1	3.2	3.2
Lakeshore erosion is problematic on Lake Austin *(M)*[1]	3.0	3.0	3.0	3.0
The wake generated by motorized vessels are problematic on Lake Austin*(M)*[1]	3.0	3.7	2.7	3.4

[1] Response categories: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

[17] F=21.94, df= 2, 447, p= 0.000

SECTION 5: Boat Counts –Aerial and Parking Lot

A. Aerial Counts

Our reporting of the aerial boat counts and parking lot counts is divided into four count zones. For the aerial boat counts, the total number of boats within three categories was tallied from the maps of the lake constructed from aerial photographs. Count averages for flights are reported in Table 36, the numbers of boats by type are identified within count zones in Table 37 and Figure 8 provide an example of an individual count for Sunday, August 31, 2008 which was during the Labor Day weekend.

The count figures reported here do not represent the exact number of boats within each count zone at a specific time because of the flight patterns across the lake. Images captured on each overpass of the lake meant that boats moving across the lake could potentially be missed or potentially counted twice.

Displayed in Tables below are the counts for three categories of boats: a) PWCs, b) pontoon boats, and c) all other boats. These are presented for each flight. The first flight was aborted in Zone 3 (flight route led from west to east). This resulted in no data being reported for Zones 1 and 2 for this flight. Our reporting of the average use across zones for Lake Austin does not include flight one. All other flights were conducted on the weekends.

Most use on Lake Austin occurs around Zones 1 and 2. This pattern was observed across all but the flight that occurred Sunday, July 20th. Across all flights, Zone 1 averaged 37 (36.7) boats and Zone 2 approximately 43 boats. Use fell some in Zones 3 and 4. Zone 4 was proportionally much lower with the exception of July 20,th when it had the highest use (60 boats) of any zone.

Table 36. Average Weekend Aerial Counts by Boat Type for Lake Austin (flights 2-5)

	Boat Type			
Boat Count Zone	**PWC**	**Other Boats**	**Pontoon**	**Total**
Zone 1	4.7	31.3	.7	36.7
Zone 2	7.3	33.7	2.3	43.3
Zone 3	2.7	22.0	3.7	28.4
Zone 4	.7	23.3	1.7	25.7
Total	15.4	110.3	8.4	134.1

Table 37. Lake Austin, Flight 5, 8/31/2008 (Sunday –Labor Day Weekend)

	Boat Type			
Boat Count Zone	**PWC**	**Other Boats**	**Pontoon**	**Total**
Zone 1	0	39	1	40
Zone 2	2	36	3	41
Zone 3	0	9	1	10
Zone 4	0	4	1	5
Total	2	88	6	96

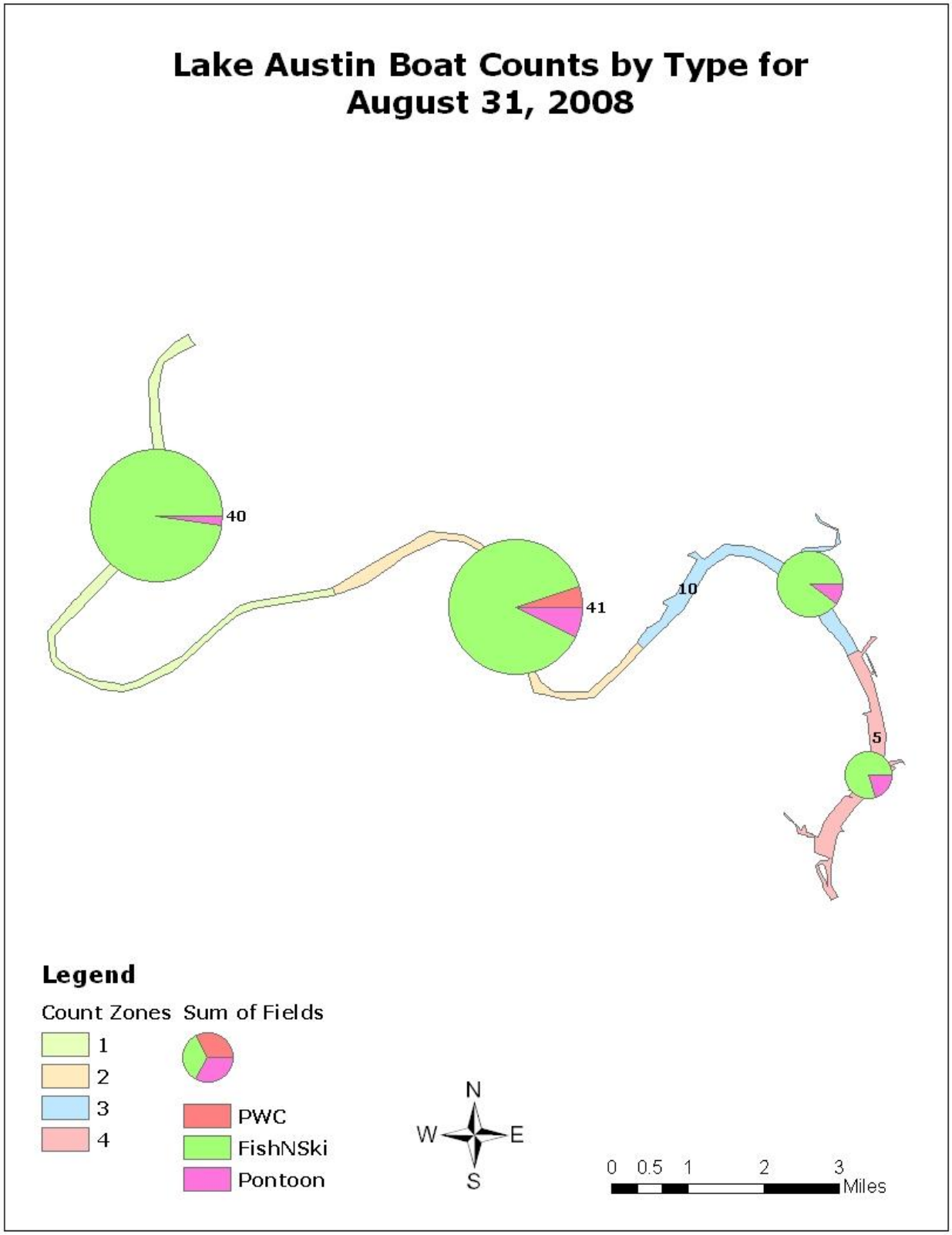

Figure 8. Summary of Lake Austin boat counts by type for August 31, 2008

B. Parking Lot Counts

For the boat ramp parking lot counts, onsite interviewers conducted counts every two hours beginning upon their arrival. Interview periods were eight hours – from 8:00am through 4:00pm and noon through 8:00pm. Counts focused on the number of: (a) cars with boat trailers, (b) cars alone, and (c) trailers alone. Displayed in Tables 38 through 40 are counts for Weekends, Weekdays and the Sunday of each holiday weekend sampled.

Upon reviewing times of the day, it is apparent that use on Lake Austin began to pick up at approximately 10 AM, peaked during the Noon to 5 PM period and then began to trail off after 6 PM. Based on vehicles in parking lots, the same basic pattern of use was apparent for both weekend and weekdays, though the average total use on weekend days was over twice what it was for weekdays.

Table 38. Parking lot counts for Lake Austin (weekend days only)

Weekends*(14 days)					
Types		With Boat Trailers	Without Boat Trailers	Trailers Alone	Sub-total
Lake Austin	8:00 AM	0	0	0	0
	9:00 AM	0	0	0	0
	10:00 AM	140	173	4	317
	11:00 AM	111	82	6	199
	12:00 PM	409	546	12	967
	1:00 PM	46	44	3	93
	2:00 PM	538	731	15	1284
	3:00 PM	73	97	4	174
	4:00 PM	632	910	10	1552
	5:00 PM	76	84	5	165
	6:00 PM	488	556	5	1049
	7:00 PM	119	155	3	277
	8:00 PM	35	14	0	49
Total		2667	3392	67	6126

*Weekends= May 31; June 1, 15, 28; July, 12, 13, 20, 26, 27; August 3, 16, 17, 23, 24

Table 39. Parking lot counts for Lake Austin (weekdays only)

Weekdays*(6 days)					
Types		With Boat Trailers	Without Boat Trailers	Trailers Alone	Sub-total
Lake Austin	8:00 AM	0	0	0	0
	9:00 AM	0	0	0	0
	10:00 AM	25	42	2	69
	11:00 AM	25	25	4	54
	12:00 PM	54	90	4	148
	1:00 PM	18	24	4	46
	2:00 PM	72	136	4	212
	3:00 PM	23	38	4	65
	4:00 PM	85	172	5	262
	5:00 PM	30	31	1	62
	6:00 PM	103	186	3	292
	7:00 PM	30	13	1	44
	8:00 PM	33	20	0	53
Total		498	777	32	1307
*Weekdays= June 16, 27; July, 21, 30, 31; August 4					

Table 40. Parking lot counts for Lake Austin (holiday only)

Holidays - Sundays, May 25, July 6, August 31, 2008					
Types		With Boat Trailers	Without Boat Trailers	Trailers Alone	Sub-total
Lake Austin	8:00 AM	0	0	0	0
	9:00 AM	0	0	0	0
	10:00 AM	64	94	5	63
	11:00 AM	0	0	0	0
	12:00 PM	97	159	2	258
	1:00 PM	0	0	0	0
	2:00 PM	122	223	3	348
	3:00 PM	0	0	0	0
	4:00 PM	160	267	3	430
	5:00 PM	0	0	0	0
	6:00 PM	153	207	2	362
	7:00 PM	0	0	0	0
	8:00 PM	0	0	0	0
Total		596	950	15	1561

C. Parking Lot & Aerial Counts

Presented below are the counts taken from the aerial photographs and in the parking lots conducted on the aerial count sampling days. Presented together, these counts provide some indication of the extent to which parking lot counts could be used as a surrogate indicator of total boating use on Lake Austin. While some of the use on Lake Austin is driven by Shoreline Property Owners, there is potential for estimating use on the lake with the knowledge that increases in parking lot use have proportionate increases in total lake use. Agencies managing recreational use on Lake Austin could then undertake their own use monitoring without the need for aerial analyses. Reported in Figure 16 below are the counts across the four data points. For these analyses, we included vehicles with trailers and trailers alone. Cars without trailers do not likely reflect an additional boat on the lake; they more likely reflect parties traveling to the lake in more than one vehicle.

Presented together in Table 41 and Figure 9 below, these data illustrate that, with the exception of the public holiday weekend flight (August 31st), the parking lot counts provide a reasonable heuristic for estimating on water use. These parking lot counts were taken from the 2:00pm count conducted each sampling day coinciding with an aerial flight. Flights over Lake Austin were conducted between 1:00pm and 3:00pm. On the public holiday, it would appear that the lake attracts considerable more use from Lakeshore Property Owners and Marina Slip Tenants. The lower parking lot count is associated with inclement weather encountered on the sampling day which disrupted counts over the noon to 5:00pm count period.

Table 41. Aerial Boat Counts and On-site Trailer Counts for Flyover Dates on Lake Austin

Dates	Aerial Count Total	Trailer Count Total @ 2:00 PM
Saturday, July 12, 2008	171	48
Sunday, July 20, 2008	140	79
Sunday, August 03, 2008	119	45
Sunday, August 31, 2008	246	102

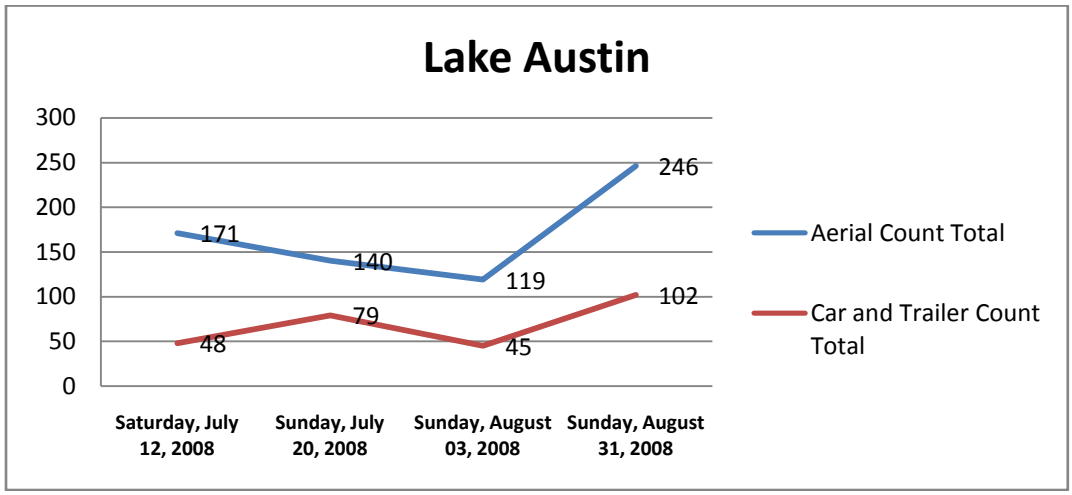

Figure 9. Aerial Boat Counts and On-site Trailer Counts for Flyover Dates on Lake Austin

D. Perceptions of Setting Density by Weekend, Weekday and Public Holidays

In Table X below, we report Boat Ramp Users perceptions of setting density on the days we conducted the aerial flights. These comparisons provide an indication of how boaters' perceived setting density on days for which we have objective boat count data. We emphasize, however, that this comparison relies only on data collected for Boat Ramp Users onsite as they were exiting the lake. In our earlier comparisons of boater use groups for these same questions (reflected in the data presented in Tables 42 through 44), comparisons were made for data collected via the mailback/online surveys. The comparisons presented below were for data collected onsite. Also, because other boaters (i.e., Lakeshore Property Owners and Private Marina Slip Tenants) perceptions of setting density were collected via the mailback/online survey, we are unable to link their responses to these items to the days we conducted the parking lot and aerial counts.

Contrary to our expectations, Boat Ramp Users perceptions of setting density and responses to encounters with others were much lower on the Labor Day public holiday weekend. While the aerial flight and surveying took place on the Saturday, our analysis of these same items for data collected on Sunday displayed the same pattern. There are several reasons for this anomaly. First and foremost, the weather during these days was erratic (i.e., storms) and a number of boaters may have deliberately stayed off the lake. It is also possible that Boat Ramp Users employed several different coping strategies to accommodate the increased use on the public holiday weekend. First, those bothered by heavy use on the lake may have simply have chosen to keep off the lake that weekend. Alternately, boaters desiring crowded conditions would be attracted to the lake on this weekend. Another strategy potentially employed by Boat Ramp Users may have involved using another area of the lake. Given their increased mobility, compared to Lakeshore Property Owners and Private Marina Slip Tenants, they are able to more readily access other areas of the lake without encountering crowded conditions. We further explore Boat Ramp Users' perceptions of setting density, presented in Tables 42 and 44 below, by comparing their mean scores on these items across weekdays, weekends and other public holidays.

For the most part, boaters' perceptions of setting density were relatively stable over the weekends. While encounters with other boaters appears to have had little impact on their enjoyment, Boat Ramp Users reported feeling most crowded while out on the lake and when exiting the lake.

Table 42. Boaters' Perceptions of Setting Density on Weekends Compared Against Public Holiday (Aerial Count Days)

Question (*Means Reported*)	**Response Categories**	*Means*[1, 2]		
		7/12	**7/20**	**8/31**
How did the number of people you saw on the lake today compare with what you expected to see?	1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected	3.2	2.6	3.0
How did the amount of use at the lake today affect your overall enjoyment of your visit?	1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment	3.2	2.9	3.4
Using the following scale, how would you describe the boating conditions at each of the following areas during your visit to Lake Austin?	1=Not at all crowded through 9=Extremely crowded			
At the launch ramp/marina at the start of your trip	1=Not at all crowded through 9=Extremely crowded	2.3	2.3	2.5
Out on the lake while boating	1=Not at all crowded through 9=Extremely crowded	3.8	4.9	4.6
Along the shoreline areas that you used	1=Not at all crowded through 9=Extremely crowded	4.4	3.6	2.7
At the launch ramp/marina when you stopped boating	1=Not at all crowded through 9=Extremely crowded	4.1	3.6	2.8
Total Aerial Count (*n*)		91	213	96
Total Parking Lot Count (*n*)		307	352	493

[1] Cases sampling dates; 7/12=17, 7/20=26, 8/31=5

[2] None of significant difference was detected on Weekends Compared Against Public Holiday.

Table 43. Boaters' Perceptions of Setting Density by Weekday, Weekend & Public Holidays (Mean)

Question (*Means Reported*)	**Response Categories**	*Means*		
		Weekdays[1]	**Weekends**[2]	**Public Holiday Weekends**[3]
How did the number of people you saw on the lake today compare with what you expected to see?	1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected	3.2	3.0	2.9
How did the amount of use at the lake today affect your overall enjoyment of your visit?[4]	1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment	2.8	2.9	2.6
Using the following scale, how would you describe the boating conditions at each of the following areas during your visit to Lake Austin?	1=Not at all crowded through 9=Extremely crowded			
At the launch ramp/marina at the start of your trip[4]	1=Not at all crowded through 9=Extremely crowded	2.0	2.8	3.1
Out on the lake while boating[4]	1=Not at all crowded through 9=Extremely crowded	2.5	4.5	4.3
Along the shoreline areas that you used[4]	1=Not at all crowded through 9=Extremely crowded	1.8	4.0	3.9
At the launch ramp/marina when you stopped boating[4]	1=Not at all crowded through 9=Extremely crowded	2.1	4.3	3.8
Total Parking Lot Count (*n*)		1,307	6,126	3,539

[1]Weekdays: June, 16; June 27; July, 21; July 30, 31; August 4 (6 Days)
[2]Weekends: May 31; June 1, 15, 28; July, 12, 13, 20, 26, 27; August 3, 16, 17, 23, 24 (14 Days)
[3]Public Holiday Weekends: May 25, 26; July 4, 5, 6; August 30, 31, September 1 (8 Days)
[4]We observed significant differences across Weekday, Weekend & Public Holidays for crowding items. Test values were: the amount of use at the lake today affect your overall enjoyment of your visit- F= 3.770, df=2,267, p=.024; At the launch ramp/marina at the start of your trip - F= 4.466, df=2,361, p=.012; Out on the lake - F= 15.189, df=2,362, p<.001; Along the shoreline areas that you used- F= 14.384, df=2,294, p<.001; At the launch ramp/marina when you stopped boating- F= 15.823, df=2,360, p<.001

Table 44. Boaters' Perceptions of Setting Density by Public Holiday Weekends

Question (*Means Reported*)	**Response Categories**	*Means*		
		5/25-5/26 (Memorial Day)	**7/4 -7/6 (Independence Day)**	**8/30 – 9/1 (Labor Day)**
How did the number of people you saw on the lake today compare with what you expected to see?	1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected	2.7	2.9	3.2
How did the amount of use at the lake today affect your overall enjoyment of your visit?[1]	1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment	2.2	2.9	2.9
Using the following scale, how would you describe the boating conditions at each of the following areas during your visit to Lake Austin?	1=Not at all crowded through 9=Extremely crowded			
At the launch ram/marina at the start of your trip[1]	1=Not at all crowded through 9=Extremely crowded	4.7	2.8	1.5
Out on the lake while boating[1]	1=Not at all crowded through 9=Extremely crowded	5.5	4.0	3.3
Along the shoreline areas that you used[1]	1=Not at all crowded through 9=Extremely crowded	5.0	3.2	3.3
At the launch ramp/marina when you stopped boating[1]	1=Not at all crowded through 9=Extremely crowded	4.9	3.2	3.9
Total Parking Lot Count (*n*)		771	2,164	1,085

[1]We observed significant differences across Public Holidays for 5 setting density items. Test values were: the amount of use at the lake today affect your overall enjoyment of your visit- F= 5.852, df=2,108, p=.004; At the launch ramp/marina at the start of your trip - F= 20.856, df=2,107, p<.001; Out on the lake - F= 10.022, df=2,107, p<.001; Along the shoreline areas that you used- F= 7.323, df=2,96, p<.001; At the launch ramp/marina when you stopped boating- F= 6.306, df=2,106, p=.00

SECTION 6: Comparisons Across Lakes Travis, Lyndon B. Johnson, and Austin.

The methodology and survey questionnaire used to collect the data presented in this report were also implemented, concurrently, at Lake Travis and Lake Lyndon B. Johnson (LBJ). In this section, we compare boaters' responses on several key variables across the three lakes.

A. Boaters' Household Information

Overall, the sample was very well educated with over 97 percent (97.6%) having some post high school education. However, respondents from Lake Austin had more formal education than respondents from Lake Travis and Lake LBJ[18]. Almost 60 percent (58.3%) of Lake Austin respondents reported having some post graduate education. Forty-five percent indicated having completed a post graduate degree.

Table 45. Education

(%)	**Lake Austin**	**Lake Travis**	**Lake LBJ**	**Overall**
8th grade or less	0	0	0.1	0
9th to 11th grade	0.4	0.2	0.6	0.3
12th grade (high school graduate)	1.9	3.4	6.3	3.9
13-15 years (some college)	11.2	19.8	17.5	17.4
16 years (college graduate)	28.1	32.6	33.3	31.7
17+ years (some graduate school)	13.3	11.6	10.2	11.6
Masters, Doctoral, or Professional Degree	45.0	32.4	31.9	35.0

[18] χ^2=55.5, df=12, p<.001

Most respondents were employed fulltime (58.2%). However, a third (33.7%) of the respondents from Lake LBJ were retired compared to 18.5 percent from Lake Travis and 16.5 percent from Lake Austin[19].

Table 46. Employment Status

(%)	**Lake Austin**	**Lake Travis**	**Lake LBJ**	**Overall**
Employed, full time	61.2	64.1	47.1	58.2
Employed, part time	4.3	1.7	1.0	2.1
Retired, but working full time	3.5	2.5	3.4	3.0
Retired, working part time	8.7	7.6	11.0	8.8
Retired, not working	16.5	18.5	33.7	22.8
Homemaker	2.9	2.2	2.1	2.3
Unemployed	0.4	0.6	0.1	0.4
Student	0.4	0.2	0.1	0.2
Other	2.1	1.9	1.5	2.2

[19] χ^2=127.7, df=18, p<.001

Overall, respondents reported relatively high annual household incomes. Respondents from Lake Austin, however, reported the highest annual household incomes[20] with 36.4 percent earning over $300,000.

Table 47. Household Income

(%)	**Lake Austin**	**Lake Travis**	**Lake LBJ**	**Overall**
Less than $25,000	0.2	1.4	0.8	1.0
$25,000 - $49,999	2.1	5.2	6.5	5.0
$50,000-$74,999	4.9	8.3	10.9	8.5
$75,000-$99,999	8.6	11.8	11.1	10.9
$100,000-$149,999	16.6	23.3	18.1	20.7
$150,000-$199,999	13.3	14.6	11.2	13.3
$200,000-$249,999	10.0	9.5	10.7	9.5
$250,000-$299,999	7.9	7.0	5.8	6.8
$300,000 or more	36.4	19.0	24.9	24.4

[20] χ^2=78.4, df=16, p<.001

B. Watercraft Ownership and Visit Characteristics

Across all lakes, the most popular watercraft that respondents indicating owning were runabout/speed boats (overall=64.4%). Respondents from Lake LBJ reported the highest boat ownership (94.4%)[21]. They were also the most likely to report owning a fishing/bass boat (28.6%)[44], pontoon boats (23.1%)[44], and/or a PWC (waverunner/jetski) (55.9%)[44]. The only other significant variation across the lakes in the type of watercraft owned were sailboats - respondents from Lake Travis reported the highest ownership (26.2%)[44]. For all other boating categories, there was little variation in boat ownership across the lakes.

Last, while there was little variation in the reported size of respondents' boats across lakes, boaters on Lake Travis used watercraft with the most power (*M* horsepower=244.2) followed by Lake LBJ (*M* horsepower=214.8) and then Lake Austin (*M* horsepower=161.1)[22].

Table 48. Watercraft Ownership

(%)	Lake Austin	Lake Travis	Lake LBJ	Overall
Boat ownership (% yes)[1]	87.3	82.8	94.4	87.4
Runabout /speed boat	65.4	57.5	66.9	64.4
Fishing/bass boat	14.7	20.2	28.6	22.4
Pontoon boat	14.9	18.0	23.1	19.6
House boat	9.4	11.2	9.8	10.7
Cabin cruiser	10.2	17.7	9.2	13.6
High performance boat	15.5	15.1	12.7	14.9
PWC (Waverunner/jetski)	24.7	30.6	55.9	38.6
Sailboard	9.3	14.1	12.1	12.8
Canoe or kayak	26.5	26.0	28.6	27.8
Sailboat	10.4	26.2	17.1	20.3
Other	12.2	12.7	16.8	14.4
Boat size (feet)[2]	19.9	22.5	21.6	20.0
Boat horsepower[2]	161.1	244.2	214.8	183.1

[21] Fishing/bassboat:χ^2=49.6, df=2, p<.001, pontoon boat: χ^2=23.1, df=2, p<.001, PWC: χ^2=213.1, df=2, p<.001, sail boat: χ^2=39.3, df=16, p<.001

[22] F=10.7, df=2,1057, p<.001

[1] Question presented to property owners alone.

For the most part, boaters across all lakes began their boating trips at approximately the same time. The only noticeable variation was for those headed onto the lake with a fishing/bass boat. On Lake Austin, fishing/bass boat users departed (on average) at 9:04am in the morning, compared with 9:42am on Lake Travis and 10:13am on Lake LBJ[23].

There was some variation across the lakes with regard to the most popular activities. For Lake Austin, The most popular activities were; 1) fishing (81.8%), 2) PWC use (75.8%), and 3) water skiing/wake boarding/tubing/water sports, (52.2%). For Lake Travis, PWC use was most favored (82.5%) followed by fishing (79.8%), and then cruising. For Lake LBJ, most popular was fishing (77.7%) followed by Water skiing/wake boarding/tubing/water sports (55.7) and then PWC use (71.6%).

While group sizes varied little across the lakes, there was some variation in the group composition of boaters' parties. Although most respondents indicated boating with family and friends (range from 48.1% to 53.1%), boaters on Lake LBJ were more inclined than boaters at Lakes Travis or Austin to indicate boating with their family alone (37.6%)[24].

There was noticeable variation across the lakes with regard to respondents' lake homes being their primary residence[25]. While a little over 83 percent (83.2%) of Lake Austin and 70 percent (70.8%) of Lake Travis respondents reported their lakeshore property as their primary residence, only 43 percent (43.6%) of Lake LBJ respondents indicated their lake house was their primary residence.

Last, Lakes Travis and LBJ appear to be destination lakes with boaters travelling farther to access the lakes and staying longer. Lake Austin appears to be primarily used by residents from the Austin area with 84 percent (84.2%) indicating having traveled less than 10 miles to access the lake and 93 percent (93.4%) residing within 25 miles of the lake. While boaters on Lake Travis travel farther to access the lake, most use (81.4%) still comes from within a 50 miles radius. There is a significant segment (13.8%), however, that do come from well outside the local counties (> 100 miles). For Lake LBJ, a good portion of use comes from non-local boaters with over 40 percent (40.5%) of respondents indicating residing more than 50 miles from the lake. Similar to Lake Travis, a significant segment (13.5%) travels from further than 100 miles.

[23] $F=25.3$, $df=2,170$, $p<.001$
[24] $\chi^2=95.3$, $df=14$, $p<.001$
[25] $\chi^2=200.3$, $df=2$, $p<.001$

Table 49. Visit Characteristics

(%)	Lake Austin	Lake Travis	Lake LBJ	Overall
Time began boating[1]	10:25	10:51	10:46	10:41
Runabout /speed boat	10:33	10:54	10:36	10:47
Fishing/bass boat	09:04	09:42	10:13	9:27
Personal watercraft (PWC)	11:43	11:48	11:11	11:38
Activities engaged (*M* % time)				
i. Swimming (from boat)	26.7	42.7	32.6	37.4
ii. Cruising	48.6	57.3	51.5	53.3
iii. Fishing (from boat)	81.8	79.8	64.8	77.7
iv. Relaxing/sunning (boat stationary)	26.6	43.7	26.6	34.5
v. Shoreline use	19.6	45.5	31.4	30.1
vi. Water skiing/wake boarding/tubing/water sports	52.2	58.4	55.7	55.6
vii. PWC use (jetskiing)	75.8	82.5	55.6	71.6
viii. Other	46.0	47.0	70.1	49.1
Group size (*M* # of people)	4.5	5.3	5.0	5.0
Group composition (%)				
i. By yourself	2.3	2.4	2.7	2.5
ii. Family	28.4	28.2	37.6	30.6
iii. Multiple families	2.3	4.8	4.4	4.3
iv. Family and friends	53.1	48.1	50.8	50.0
v. Friends	12.2	11.8	3.9	9.8
vi. Organized outing group	0.4	2.1	0	1.2
vii. Other	1.3	2.4	0.5	1.7
Primary Residence (% yes)	83.2	70.8	43.6	62.2
Distance travelled (*M* miles)	10.3	32.6	52.1	33.8
10 miles or less (%)	84.2	42.8	38.5	55.2
11 - 25 Miles	9.2	32.5	5.8	15.8
26 – 50 miles	3.9	6.1	15.4	8.5
51 – 75 miles	1.3	3.3	13.5	6.0
76 – 100 miles	0	1.5	13.5	5.0
More than 100 miles	1.3	13.8	13.5	9.5

[1]Question presented to boaters onsite at public boat ramps only

[2] Some Lakeshore Owners don't have immediate access to the lake

C. Perceptions of Setting Density

For all indicators of crowding, respondents from Lake Austin were most sensitive to encountering others on the lake. They were most inclined to indicate that they would have preferred seeing fewer people (*M*=4)[26], encountered more than they expected (*M*=3.4)[27], indicated that encounters with others detracted from their enjoyment (*M*=3.7)[28], and felt the most crowded *(M*=5.9)[29]. For the most part, respondents from Lakes Travis and LBJ reported similar responses to the setting density items with the exception of the 9-point crowding item (last item in Table X below). For this item, they expressed feeling slightly more crowded (*M*=4.9*)* than boaters on Lake LBJ (*M*=4.5).

Table 50. Perceptions of Setting Density

Mean	**Lake Austin**	**Lake Travis**	**Lake LBJ**	**Overall**
How do you feel about ***the number of people*** you encountered on your visits to Lake X for the 2008 season?[1]	4.0	3.5	3.4	3.6
How did ***the number of people you saw*** on the lake compare with what you expected to see on your visits to Lake X for the 2008 season?[2]	3.4	3.0	3.0	3.1
How did ***the number of people you saw*** affect your overall enjoyment of your visits to Lake X for the 2008 season?[3]	3.7	3.3	3.2	3.4
Using the following scale, how would you describe the boating conditions out on the lake during your visits to Lake X for the 2008 season?[4] (presented to all in follow-up/mailback survey)	5.9	4.9	4.5	5.0

[1] Response categories: 1=Would like to have seen a lot more people, 2=Would like to have seen a few more people, 3=Neither too many nor too few people, 4=Would like to have seen a few less people, 5=Would like to have seen a lot less people

[2] Response categories: 1=A lot less than I expected, 2=A little less than I expected, 3=About what I expected, 4=A little more than I expected, 5=A lot more than I expected, [3] Response categories: 1=Added a lot to my enjoyment, 2=Added a little to my enjoyment, 3=No effect on my enjoyment, 4=Detracted a little from my enjoyment, 5=Detracted a lot from my enjoyment

[4] Response categories: 1=Not at all crowded through 9=Extremely crowded

[26] F=55.0, df=2,2127, *p*<.001
[27] F=30.3, df=2,2128, *p*<.001
[28] F=50.8, df=2,2169, *p*<.001
[29] F=64.7, df=2,2169, *p*<.001

D. Perceptions of Boating Regulations

With regard to respondents' perceptions of potential boating regulations, the only variation across the lakes that we observed was for the introduction of statewide regulations that lower noise by requiring mufflers and prohibiting fat sacks, plows or other wake generating devices. For both of these items, boaters from Lake Travis and Lake LBJ expressed slightly stronger support[30].

We also observed variation across lakes with regard to boaters' attitude toward public agencies' efforts to inform the public of boating regulations[31]. Boaters on Lake Austin (*M*=2.8) were slightly more critical than boaters from either Lake Travis (*M*=3.1) or Lake LBJ (*M*=3.1).

Last, across Lakes Travis and LBJ, few boaters offered support for extending the "50 foot rule" with support below 30 percent. Of those that did indicate support for extending the no wake zone, respondents from Lake Travis suggested extending to almost 100 feet (97.2') and the average for respondents from Lake LBJ was almost 90 feet (88.3'). On Lake Austin control of wakes is not well developed in current regulations. Lake Austin respondents indicated that wake generation was a primary issue of concern suggesting that managers should look more carefully at the issue.

[30] Limit noise: F=8.7, df=2,2065, $p<.001$, Wake generating devices: 6.5, df=2,2048, $p<.001$
[31] F=51.6, df=2,2029, $p<.001$

Table 51. Perceptions of Boating Regulations

	Lake Austin	Lake Travis	Lake LBJ	Overall
Statewide regulations that lower noise levels on the lake by requiring mufflers on motor boats *(M)*[1]	3.1	3.6	3.4	3.5
Design zoning and restricting areas of Lake X for specific uses *(M)*[1]	n/a	2.7	2.5	2.6
Design zoning and restricting areas of Lake X for specific uses on specific days throughout the year such as public holiday weekends *(M)*[1]	n/a	2.9	2.8	2.8
A statewide speed limit on public lakes in Texas *(M)*[1]	n/a	3.1	3.0	3.0
Speed limits in specific "use zones" on Lake X *(M)*[1]	n/a	3.5	3.3	3.4
Uniform regulations that apply to the entire lake and not exclusively to areas of the lake *(M)*[1]	n/a	3.2	3.2	3.2
Uniform regulations that apply to all public waters in Texas and not exclusively to specific lakes or water bodies *(M)*[1]	n/a	2.9	2.9	2.9
Prohibit fat sacks, plows and other wake generating devices *(M)*[1]	2.9	3.2	3.2	3.2
The public agencies do a good job of regulating recreational boating use on Lake X *(M)*[2]	3.4	3.4	3.6	3.4
The public agencies do a good job of informing the public of boating regulations on Lake X *(M)*[2]	2.8	3.1	3.1	3.1
Would you be in favor of extending the 50 foot rule? (%, *n* yes)	n/a	29.8%, 293	26.7%, 180	29.0%, 450
If "yes", by how many feet would you prefer the exclusion zone be extended? (*M*)	n/a	97.2'	88.3'	95.1'
Do you feel that the wakes generated by motorized vessels are problematic on Lake X? (%, *n* yes)	n/a	55.7%, 555	36.5%, 244	49.3%, 770

[1] Response categories: 1=Strongly opposed, 2=Somewhat opposed, 3=Neutral, 4=Somewhat supportive, 5=Strongly supportive

[2] Response categories: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

SECTION 7: Recommendations for Future Research

In the following, we offer some suggestions for the future systematic evaluation of recreational boating use on Lake Austin. Throughout the conduct of this study, we were provided considerable insight on how the LCRA and the City of Austin could efficiently conduct data collection for the years to come. With the population around Lake Austin continuing to grow (see Kyle, 2007), the level of use is likely to grow and present the City of Austin with a number of issues related to recreational boating.

Alternate Data Collection Strategies

One of the challenges that we encountered was accessing the Private Marina Slip Tenants using scientifically valid methods. Owing to the need for private marina operators to protect the privacy of their tenants, marina managers were reluctant to disclose the names and addresses of their tenants for us to send a survey. Several marinas refused to participate and several others that agreed to participate, preferred that we send them the surveys for their distribution. Without knowing how many surveys were distributed, how they were distributed and to whom, we are unable to provide estimates of response rates. This does not allow us to determine the representation of the private marina user population.

An alternate approach would be to acquire names and addresses from boater registration files provided by the Texas Parks and Wildlife Department. Given that over 90 percent of use on Lake Austin comes from within 25 miles of the lake, names and addresses could be filtered to reflect boaters residing within neighboring counties. This approach would provide a sample that more likely reflects the population of local use of Lake Austin. Surveying boaters using this method could be more efficiently conducted at more regular intervals (i.e., five years).

Using this method of sampling, however, does ignore a significant and potentially important segment of use; i.e., lake visitors from afar. We would still recommend conducting comprehensive examinations of recreational boating use on Lake Austin, using similar methods employed in this investigation, at least every 10 years. Boaters traveling from afar contribute significantly to the local economies and respond differently to encountering others. Because of their investment in their visit (e.g., time and financial), they tend to be more tolerant of encountering higher levels of use but are also more willing to substitute lakes. Investigations using the methods we've employed also allow for the objective evaluation (i.e., parking lot and aerial counts) of use and its effect on visitors' safety (and perception thereof) and enjoyment and a variety of other issues tied to boaters' use and experience of Lake Austin.

Acquiring New Data

Analysis of Shoreline Development and Urban Growth

Given that over 90 percent of use originates from the surrounding communities of Lake Austin, efforts to systematically monitor population growth occurring in these areas would provide the City with insights on the location of potential issues that are likely to emerge in the future. With continuing population growth and urban development, Austin will likely see issues related to crowding and conflict grow on the lake. These analyses would include GIS analysis of land use and census data illustrating changes in the population characteristics of Greater Austin. If a goal of lake managers is to provide lake conditions that facilitate a variety of recreational boating experiences (e.g., opportunities for solitude, quiet, socialization, etc.), understanding population growth, change, and development will be critical for preserving a spectrum of boating experiences.

Boating Safety

While our data illustrated that a large proportion of boaters indicated having participated in some form of a boating safety/education class (i.e., >43%), we did not offer a definition for this "class" or specify the kind of class we would consider meeting basic education/safety requirements. Given the relatively high percentage of respondents who indicated participating, we suspect that they adopted a fairly liberal definition of "class". Consequently, we feel further investigation of Lake Austin boaters' understanding of boating safety and education is warranted. This investigation would provide a more detailed illustration of boaters' knowledge of safety and boating regulations. There are several grant programs available that could help facilitate the conduct of this type of investigation.

Ongoing Analyses of Existing Data

The data presented in this report provide a comprehensive overview of boaters' characteristics and use of Lake Austin. Our presentation of findings has been predominantly descriptive. However, more detailed analysis of the data in the months and years to come will provide a more nuanced illustration of boaters and boating use on Lake Austin. These analyses will include:

- A more detailed examination of different market segments that use Lake Austin beyond the distinctions of Lakeshore Property Owners, Private Marina Slip Tenants, and Boat Ramp Users. These analyses would include consideration of respondents' use histories, management preferences, favored areas, and residential origins. The identification of relevant market segments has direct implications for the management of recreational boating use (e.g., minimize conflict, facilitate preferred experiences), efforts to communicate with boaters concerning safety and boating regulations, and to preserve conditions across the lake.
- An examination of the factors that influence boaters' perceptions of setting density. These analyses would provide greater insight on which factors shape the manner in which boaters' react to the presence and behavior of others on the lake. For example, based on our pilot data collected from the three Highland Lakes in 2007, we were able to demonstrate that boaters' expectations related to encounters with others on the lake was key in shaping their perceptions of settings density. Expectations related to use is a factor that the LCRA and City of Austin can help to shape through their communication activities (e.g., areas of the lake and time to use the lake in less crowded conditions).
- An exploration of how boaters' attachment to their favored areas impacts their perceptions of social and environmental conditions extant on the lake. Boaters more attached to the lake and specific areas of the lake (e.g., Lakeshore Property Owners) tend to be more sensitive to

encounters and the behavior of other boaters. Even though these boaters are less likely to be displaced and are more knowledgeable of lake conditions (i.e., area and times of peak use) their tolerance of perceived inappropriate behavior is lower than less attached boaters.

REFERENCES

City of Austin. (2007). *2007 Annual Citizen Survey: City of Austin.* Austin, TX: City of Austin. (http://www.ci.austin.tx.us/budget/06-07/downloads/citizensurvey2007.pdf)

Dillman, D. A. (2000). *Mail and internet surveys: The tailored design method.* New York: Wiley.

Kim, S. S., Scott D., & Crompton, J. L. (1997). An exploration of the relationships among social psychological involvement, behavioral involvement, commitment, and future intentions in the context of birdwatching. *Journal of Leisure Research, 29*, 320-341.

Kyle, G. T., Mowen, A. J., & Tarrant, M. (2004). Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *Journal of Environmental Psychology*, *24,* 213-225.

Miller, T. A., & McCool, S. F. (2003). Coping with stress in outdoor recreational settings: An application of transactional stress theory. *Leisure Sciences, 25*, 257-275.